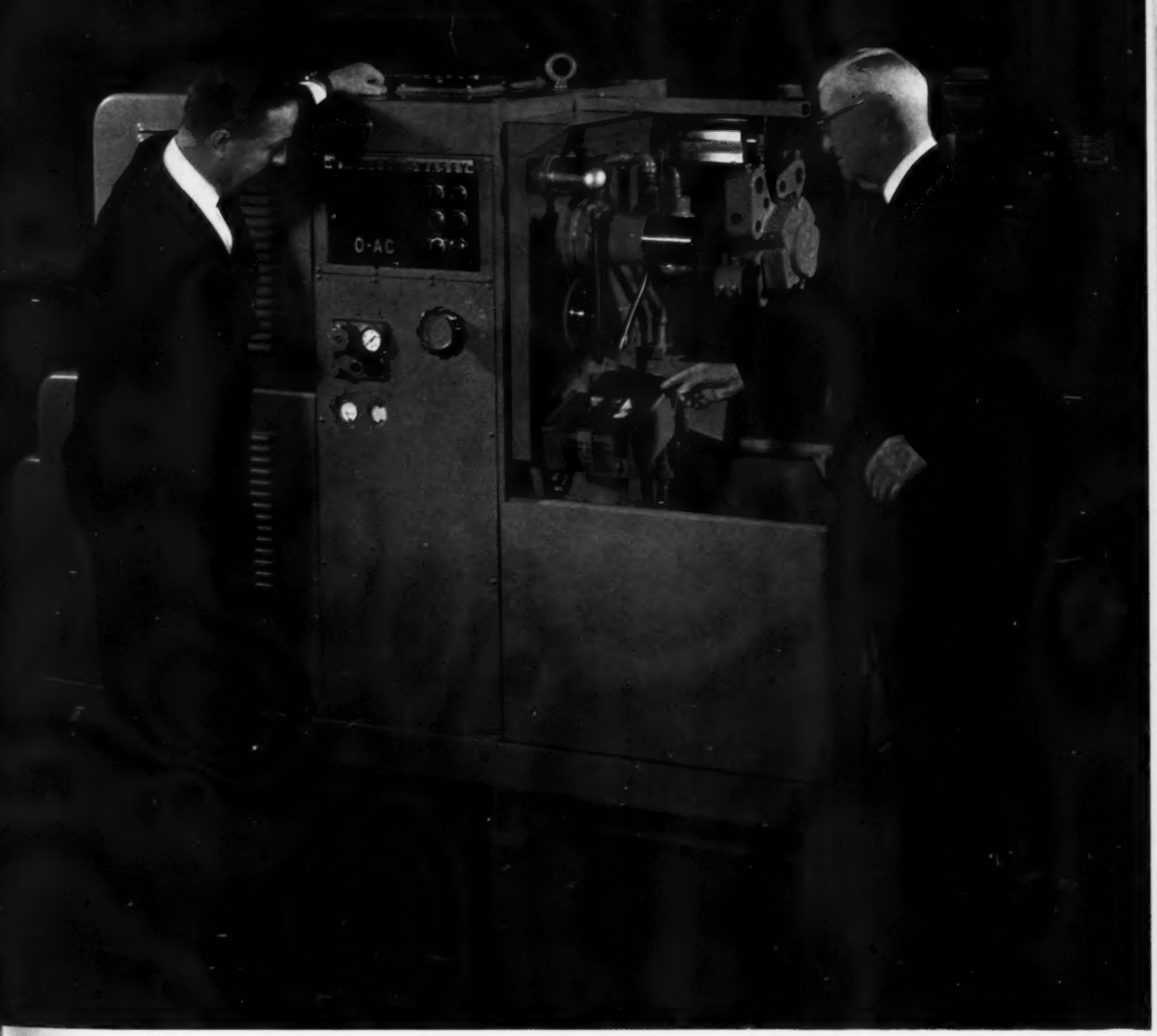
JUNE 1960

TOOLING & PRODUCTION

Magazine



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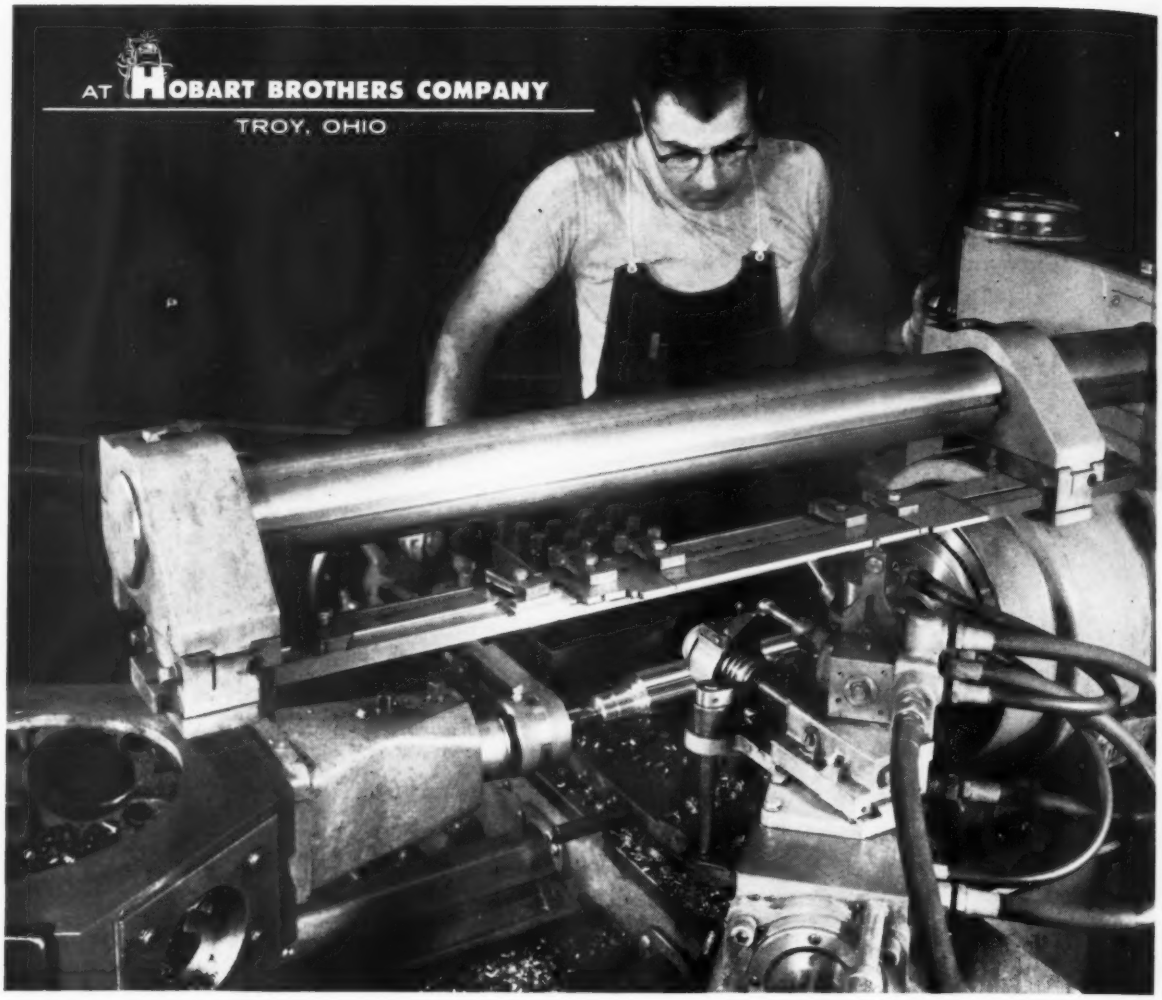

Warner & Swasey 2-A with contouring cross slide

Slashes setup time—from 2 hours to 20 minutes • Combines auxiliary operations into one setup • Produces shafts at 1948 cost levels

Hobart Brothers Co. faced a serious production bottleneck. Long setup time on their older turret lathes and excessive part handling time was crippling the small lot production of motor-generator shafts. Because their production scheduling for 77 different models of arc welders, 20 models of ground-power units, plus numerous specials, is tied directly to sales, lot sizes frequently had to remain small—usually from 1 to 20 pieces.

Hobart launched a three-pronged attack to solve the problem by:

1. Installation of a new Warner & Swasey 2-A Saddle Type Turret Lathe equipped with a hydraulically-controlled cross slide contour unit.
2. A creative tooling approach to reduce setup time.
3. A thorough time and motion study to insure efficient utilization of daily production time.

As a result, Hobart Brothers today are producing shafts at 1948 production costs!

Contributing to the success of this efficiency study and modernization program was their new contour cross slide equipped Warner & Swasey 2-A which also permitted:

- **Combining of center drilling, facing and threading operations into a single, efficient turret lathe setup reducing part handling time.**
- **Production time savings averaging 35% because of higher horsepower and spindle speeds, and elimination of extra hex turret and square turret handling time.**
- **Holding closer tolerances which reduced grinding time and extended grinding wheel life.**

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Cleveland
PRECISION MACHINERY SINCE 1880

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CIRCLE INFORM-A-GRAM KEY NO. 2

TOOLING & PRODUCTION Magazine

VOL. XXVI, No. 3

JUNE 1960

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"Some Advantages of Hydraulically-Equipped Dies"

"Drilling and Turning Fixture Designs"

"Fixture Shows How Gears Are Generated"

and many other helpful features!

BPA

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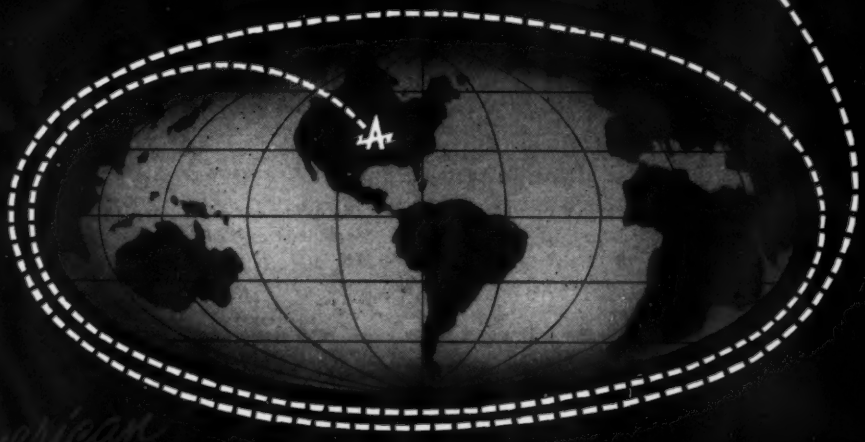

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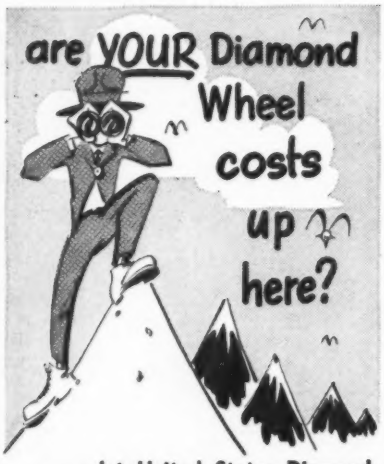

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CIRCLE INFORM-A-GRAM KEY NO. 4

JUNE 1960

VOL. XXVI, No. 3

GEORGE J. HUEBNER, Founder

1885 - 1956

personally speaking...

Dear T & P Reader:

Especially worth mentioning at this time is the 75th Anniversary Celebration of a company that at one time or another probably has been a supplier of yours. I'm talking about the Norton Company of Worcester, Massachusetts.

The Norton story is a fascinating one. A group of representatives of the press recently were afforded the opportunity of learning much about the Norton Company and its very interesting background and growth. This was on May 4th, which date really was the inception of the 75th Anniversary Celebration.

One item of very special interest is that descendants of the founders are still actively operating the business. Milton P. Higgins, now President, is a grandson of the Milton P. Higgins who was the company's first President back in 1885, and one of the founders of the business. Another founder of the business was John Jeppson, and his son, George N. Jeppson, is present Chairman of the Board while his grandson, John Jeppson, is a Vice President and General Manager of the Abrasive Division.

Also worthy of very special note is the remarkable growth that the company has achieved under its very able management. The growth has occurred essentially through a continual program of reinvestment. One member of the organization told me that he had heard of only one instance when the company ever went beyond its owners to obtain funds for expansion purposes. This is especially remarkable when you consider that today the company has six plants in the United States plus 18 plants in foreign countries. The main plant at Worcester consists of 124 buildings on 440 acres of ground, containing 3,500,000 square feet of manufacturing space.

Space does not permit me to tell a very complete story, but one other item made a profound impression on me. This company has had, through its seventy-five years, such enlightened management that it has made all of its employees, present and past, a part of it, to the complete exclusion of unionization. Employee benefits aside from any financial considerations are so numerous that they might be called legion. The human relations record of the Norton Company certainly is one that others could well afford to emulate.

What I've talked about above no doubt has much to do also with the quality of products and services that Norton customers by this time have come to take for granted.

Cordially yours,

Ray Huebner

Publisher

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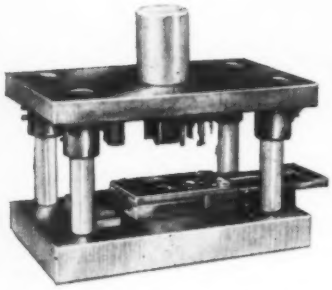
WITH PRECISION DANLY 4-POST DIE SET

In mid-'59 Weiland Tool and Manufacturing Company of Chicago replaced a worn, 7-station, progressive die to continue production of a standard latch part. The new die was built to identical specifications, except that it was mounted in a 4-post precision Danly die set instead of a 2-post set as previously used.



Latch handles are stamped out in this 7-station progressive die mounted in a precision Danly 4-post die set.

The number of pieces per die grind produced on the new die far exceeds the output from the earlier identical die. Weiland Tool estimates that, conservatively, 25% longer die life is directly attributable to the extra precision and alignment of the Danly 4-post die set.

Benefits from this longer die life are not limited to a lower per part cost of dies. In addition, Weiland Tool is avoiding considerable downtime for die sharpening and set up, and they are freeing diemakers and set-up men from unnecessary maintenance activities.

Here is proof that the finest die set obtainable, is the lowest cost insurance for your expensive dies. May we show you how Danly die set precision can save money for you. Write for the informative folder "The Importance of Die Set Precision."

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CIRCLE INFORM-A-GRAM KEY NO. 6

Talk of the Month

Sonic Energy as a Production Tool

by Thomas J. Bulat

Mr. Bulat, Manager of Sonic Energy Applications and Research Laboratories for the Pioneer-Central Division of Bendix Aviation Corp., presented the paper from which this talk is excerpted at the recent 28th annual meeting of the American Society of Tool and Manufacturing Engineers in Detroit.

SOUND IS VIBRATIONAL energy. If the vibrations occur at a frequency of 50 to 15,000 cps they are capable of being preceived by the normal human ear. Vibrations above this level are termed ultrasonic. Although sonic energy has been with us throughout the ages, its use as a production tool is comparatively recent. This came when Pierre Curie published his findings on the emanation of sound waves from electrically driven quartz crystals. One of the first practical uses of this system was a rudimentary sonar device developed by French engineers during World War I for the detection of submarines.

In the middle 1920's, exciting reports were released by scientists in Germany, England and the United States. These reports showed the use of sonic energy in mixing "immiscible" liquids, destroying bacteria, depolymerization, acceleration of chemical reactions, cleaning of intricate mechanisms, and many other applications of scientific interest.

Sonic data stirred the imagination of industrial researchers throughout the country, but applications were soon relegated to the laboratory and investigation continued only in academic circles. The reason for this lag in industrial application was that equipment was not available which could help sonic energy to move from the test tube to the production line.

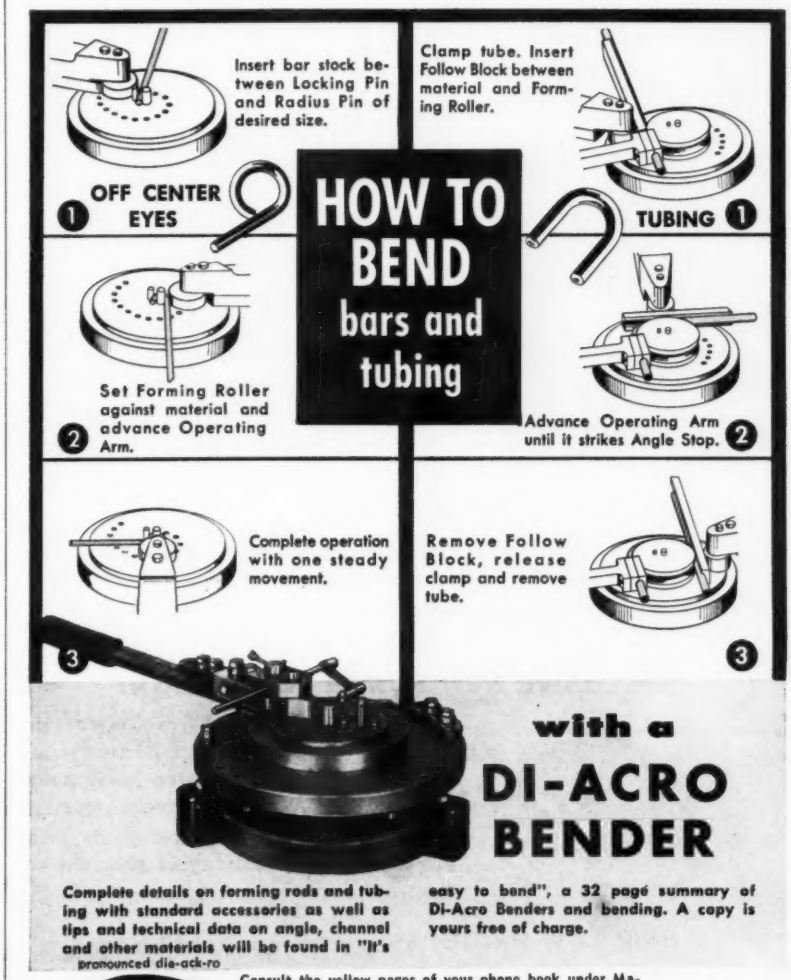
This semidormant condition persisted for years until abruptly interrupted by the technical necessities of World War II. Vast amounts of human effort and money were expended in the development of sonic energy as applied to the field of sonar.

Data and know-how accumulated during this period were made available to industry shortly after the war, thus providing a viable embryo from which present production equipment has been developed.

The Sonic System

A sonic system is composed of two basic parts: A generator and a transducer. The electrical energy provided must be at the resonant frequency of the transducer. The

. . . **Continued on page 8**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OFF CENTER EYES
1
Insert bar stock between Locking Pin and Radius Pin of desired size.
Clamp tube. Insert Follow Block between material and Forming Roller.
TUBING
1
Set Forming Roller against material and advance Operating Arm.
2
Advance Operating Arm until it strikes Angle Stop.
2
Complete operation with one steady movement.
Remove Follow Block, release clamp and remove tube.
3
3
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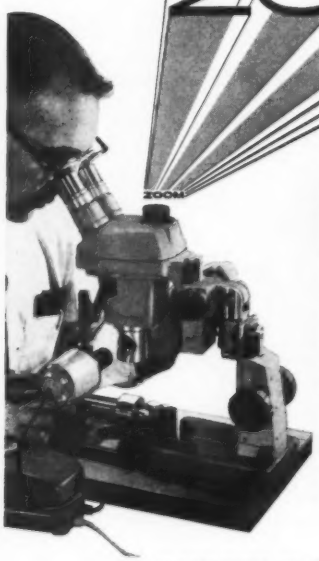

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. . . Month's Talk from page 7

generator may be either electronic or rotary.

The transducer converts the electrical energy supplied by the generator into mechanical energy in the form of vibrations. Because the transducer is the heart of the sonic system, it should be described in further detail.

Transducers fall into two classes — piezo-electric and magnetostrictive. A piezoelectric transducer is composed of a natural crystal such as quartz or a specially produced ceramic such as barium titanate which will emit sonic vibrations under the influence of an impressed voltage.

The magnetostrictive transducer is composed of a magnetostrictive metal, e.g., cobalt, nickel, iron. A magnetostrictive metal is one which undergoes dimensional change when subjected to a magnetic field. When the magnetic field is relieved, the metal returns to its natural dimensions. In a magnetostrictive sonic system, the transducer can then be vibrated through dimensional changes by introducing an interrupted or alternating magnetic field.

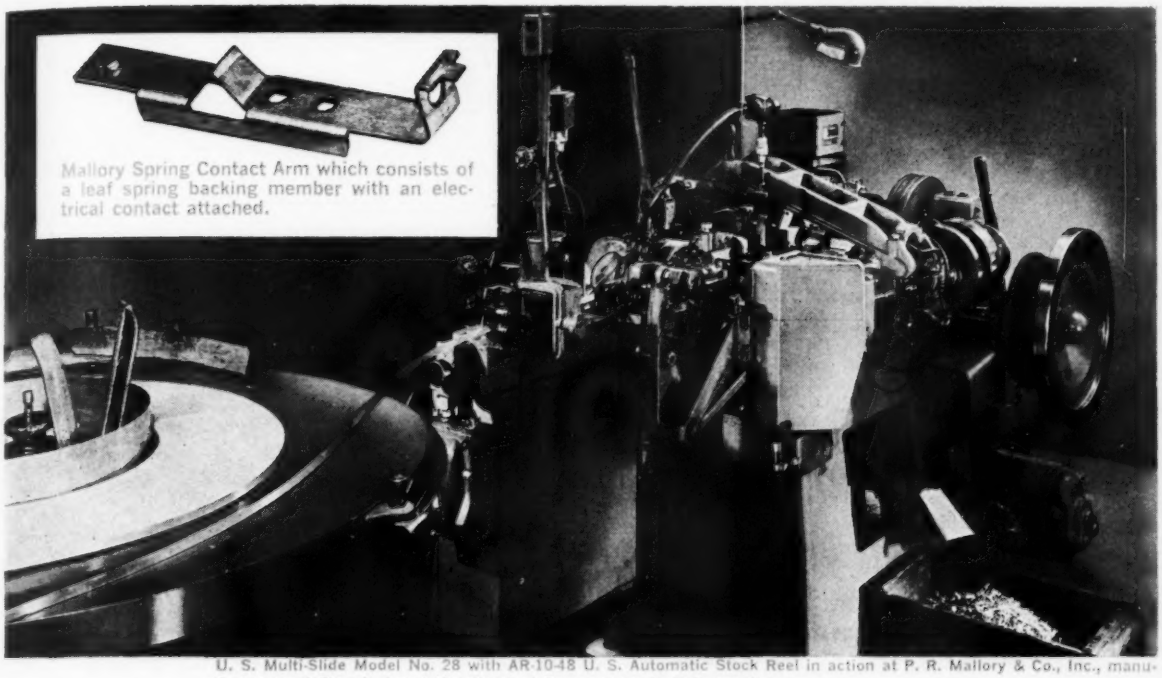
The choice of a transducer depends on the application it will be used for. Generally speaking, the crystal or ceramic transducers are used for low power applications. When these transducers are driven at high powers for extended periods of time they undergo natural degradation. The magnetostrictive transducer is used where power application is needed for extended periods of time without loss in efficiency.

Sound waves produced by either transducer can be utilized in gas, solid, or liquid media. The application of sound as a power tool is very limited in a gaseous medium, due to the attenuating effects that a gas has on sound waves. Therefore, those applications which can be considered as practical industrial tools are currently those in which sound is transmitted into a solid or liquid.

The theoretical applications of sonic energy appear to be limitless. Experimental results are exciting and provocative. In fact, it is difficult to keep from becoming

. . . Continued on page 12

U.S. MULTI-SLIDE® cuts contact assembly costs 20% at P. R. Mallory



U. S. Multi-Slide Model No. 28 with AR-10-48 U. S. Automatic Stock Reel in action at P. R. Mallory & Co., Inc., manufacturers of Electrical and Metallurgical Components, in Indianapolis.

By the use of a U. S. Multi-Slide Model No. 28, P. R. Mallory and Co., Inc. — specialists in complete contact service — entirely eliminated one costly operation in the fabrication and assembly of Spring Contact Arms.

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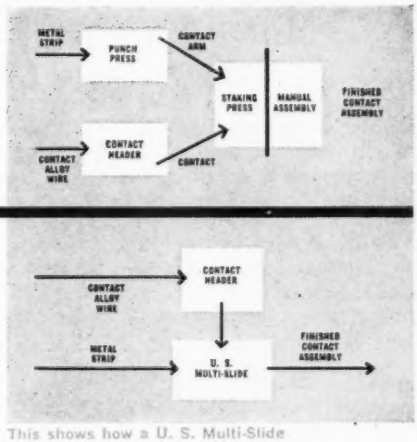

This shows how a U. S. Multi-Slide eliminated a separate staking press operation. This operation (now eliminated) required manual loading which was slow and costly.

Find out for yourself how U. S. Multi-Slides can cut costs, reduce waste and improve the quality of your products —

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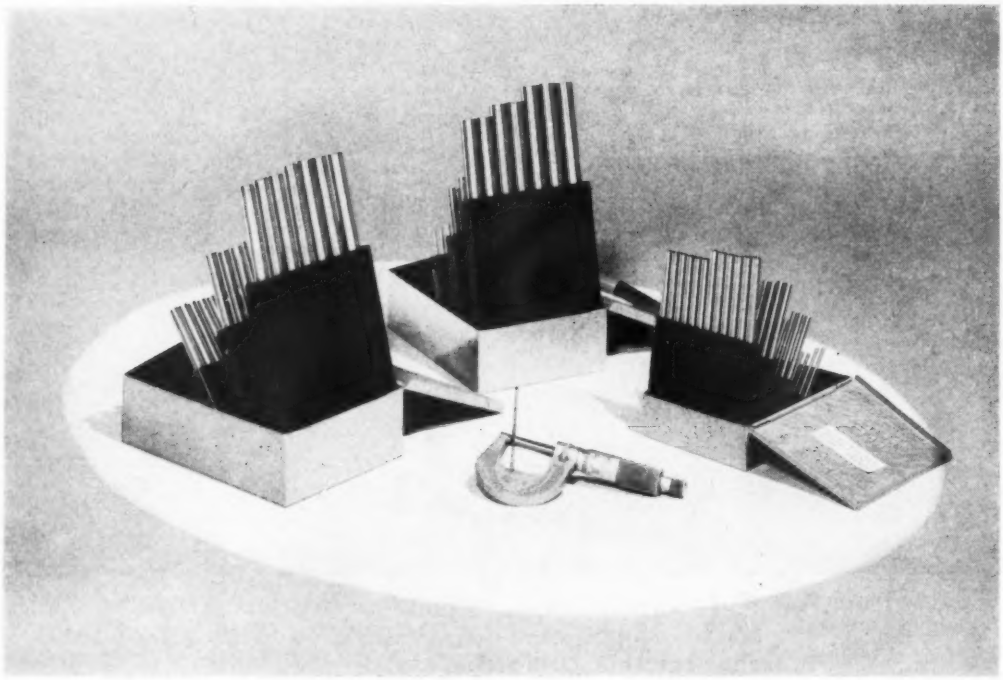

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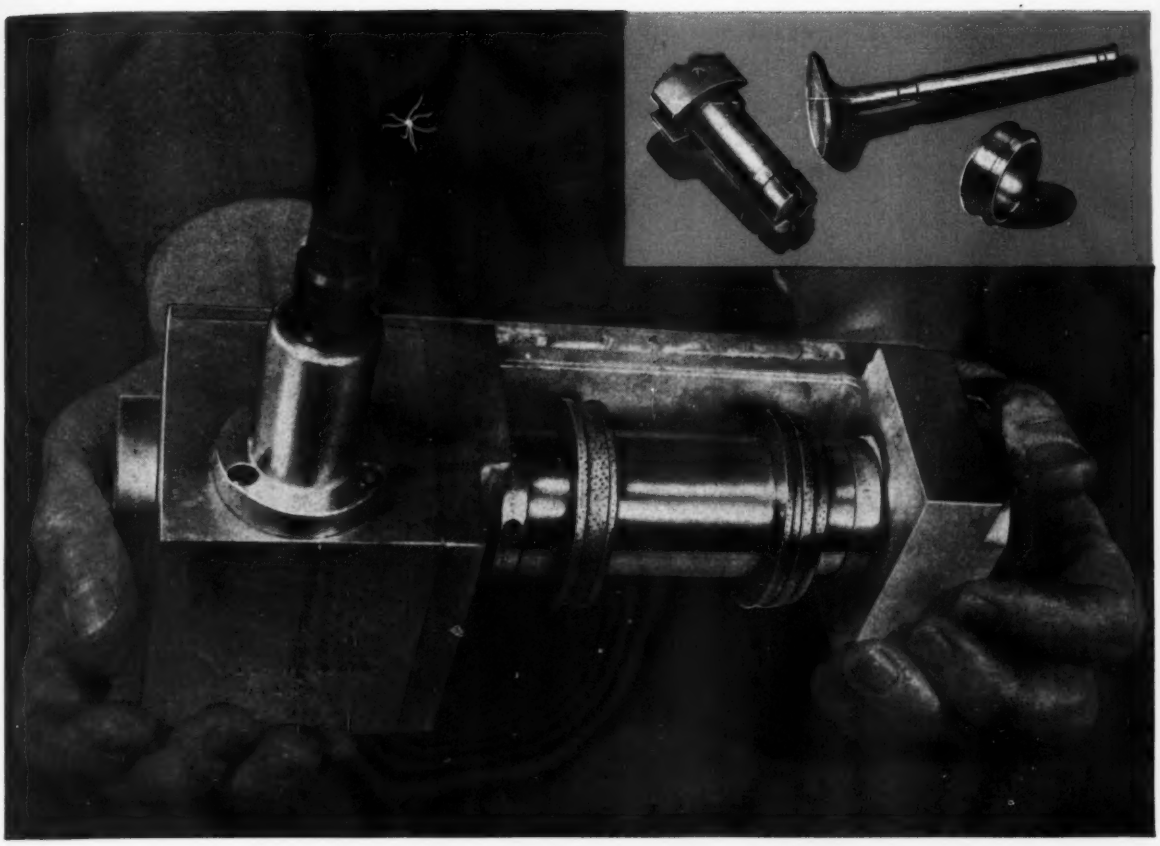

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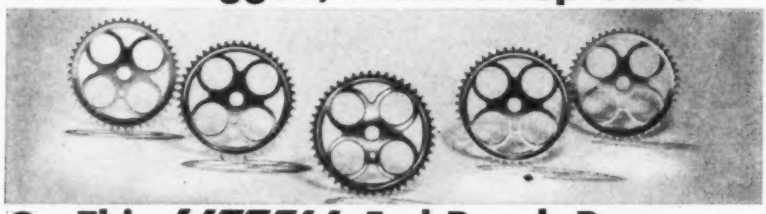
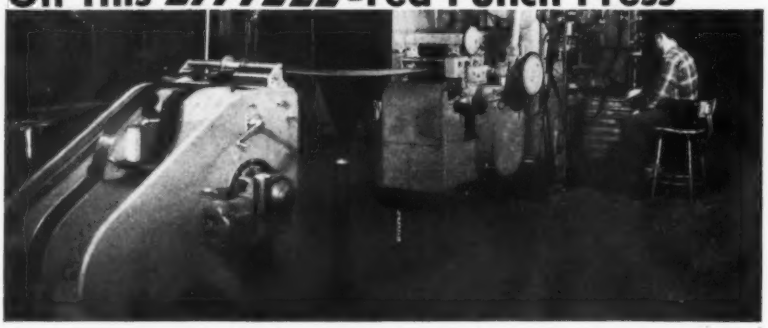
CIRCLE INFORM-A-GRAM KEY NO. 11

The Schwinn Bicycle

Gets Its Rugged, Precision Sprocket

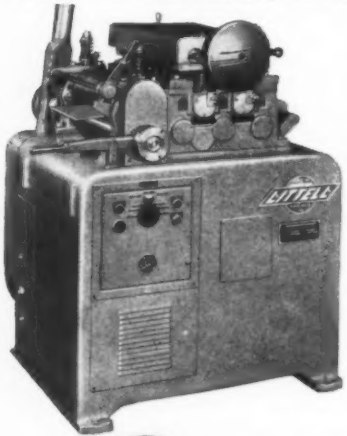


On This *LITTELL*-Fed Punch Press



Stamping out sprockets for famous Schwinn Bicyles is *precision* stamping. The special high strength steel stock is perfectly conditioned for accurate work. Flat stock, free of coil curvature, reaches the die area at perfectly timed intervals. For sprockets and other vital parts, Schwinn achieves this straightening-feeding precision economically, using the Littell "HRP" self-powered, hydraulically driven feeding and straightening machine. The "HRP" will serve you as well.

"HRP" is Versatile, Accurate, Convenient



The straightening-feeding cycle of the self-powered HRP unit is synchronized with the stamping cycle of the press by a single electrical connection. HRP units remove the coil curvature, and feed the straightened stock to the press or shear at precisely the desired speed. They feed from either side of the press, or from front to back. They can be positioned at special angles to produce specially shaped parts. Pulling an electrical plug disconnects the "HRP" from the press. Furthermore, the "HRP" can be easily moved from press to press by a lift truck. Facts in Bulletin B-10.

3 STANDARD "HRP" SIZES

STOCK CAPACITIES

12" wide x .090" thick
18" wide x .062" thick
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CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Month's Talk from page 8

overwhelmed by the possibilities inherent in the application of this form of energy for surgery, sterilization of bacteria, chemical activation, drilling, fermentation, and a host of other processes.

The excitement generated by these applications has given rise to a general over-enthusiasm on the part of many people working in the field of sonic energy. Claims have been made and numerous articles are appearing in the journals which proclaim the wonders which can be obtained through i use.

Unfortunately, the majority of these findings are strictly experimental in nature. Even more dangerous is the fact that the authors of these articles usually neglect to point out that the data is experimental. Frequently, the implication is even given that production applications are being represented.

Fundamentally, to date, there are four areas where sonic energy has been applied with repeated success under actual production conditions. These are: (1) nondestructive testing, (2) hard-substance cutting, (3) sonic-energy cleaning, and to a limited degree, (4) metals joining.

Nondestructive Testing

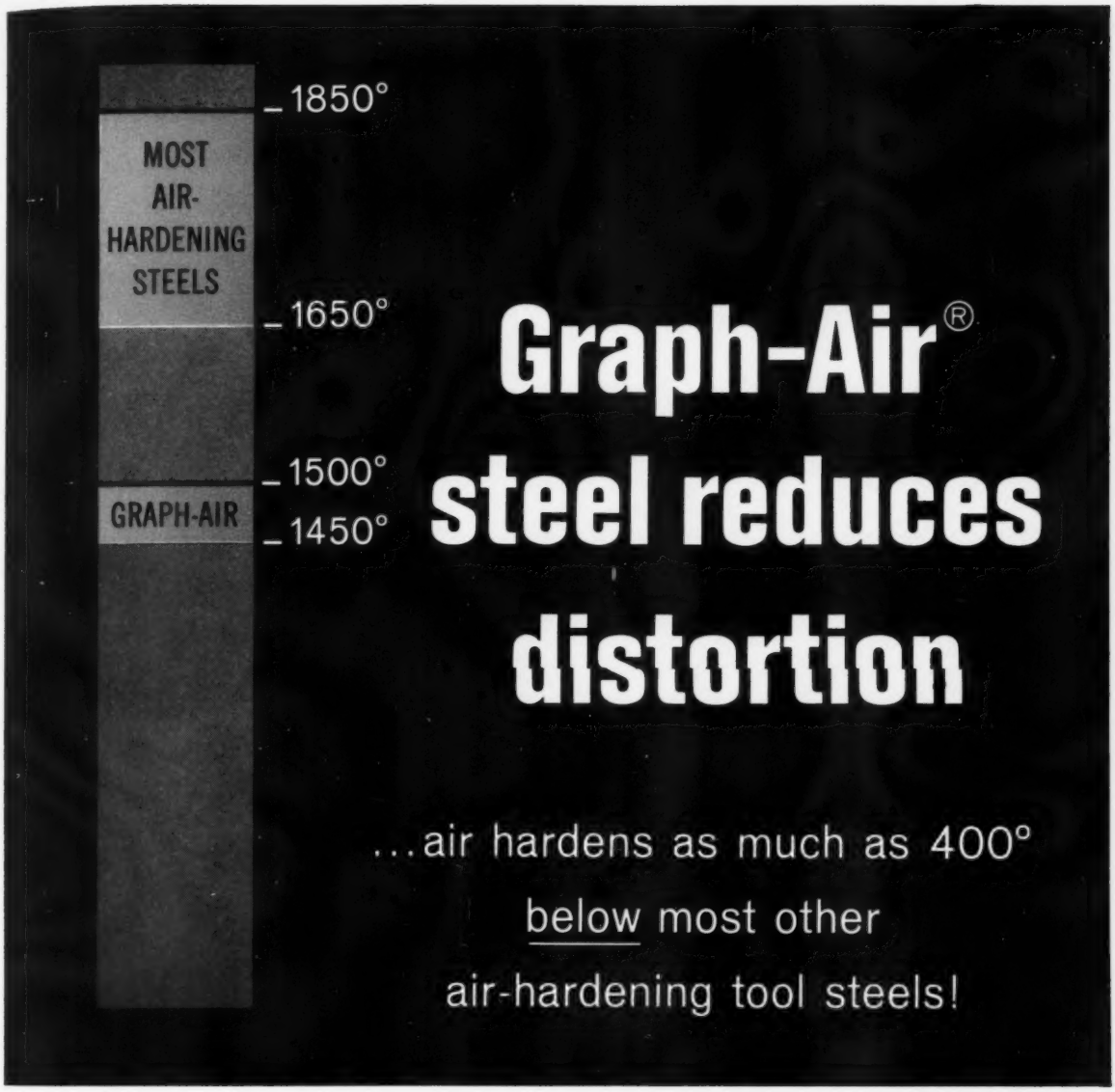
There are two methods of using sonic energy for nondestructive testing. These are the pulse-echo method and the resonance method.

In the pulse-echo method, sound is intermittently produced to be reflected or bounced back from an obstruction in its path. By determining the speed of sound in the material being tested and recording the time interval between pulse and echo, the thickness of the object can be measured.

In the resonant method, a sound signal is set up through the material being tested. Every material has a natural resonant frequency which is proportional to its thickness. By varying the input signal, this resonant frequency can be matched, and its wave length determined. A method of recording the thickness of the material is thus provided.

The properties which make these systems capable of thickness meas-

. . . Continued on page 18



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...air hardens as much as 400° below most other air-hardening tool steels!

You can simplify heat controls and reduce distortion in your heat-treated parts. Graph-Air® hardens at 1450°F.—as much as 400° below temperatures required for other air-hardening tool steels. And these lower temperatures also cut scaling and decarburization.

Graph-Air machines easier too, because of the free graphite in its structure. And because it contains diamond hard carbides throughout, it lasts and lasts—as much as three times as long as other tool steels. What's more, with its built-in stability, Graph-Air holds its accuracy better. It's one of the family of Timken graphitic tool steels, the most stable made.

If you're making intricate sections, you'll appreciate the reduced distortion of Graph-Air. It's ideal for blanking dies that must take a lot of punishment.

When you buy Timken steel you get . . . 1) Quality that's uniform from heat to heat, bar to bar, order to order. 2) Service from the experts in specialty steels. 3) Over 40 years experience in solving tough steel problems.

For high quality tool steel that air hardens at lowest temperature, be sure to specify Timken Graph-Air steel. Available in solid and hollow bar sizes. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

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***Fine Alloy* STEEL**

TIMKEN GRAPHITIC STEELS ARE CARRIED IN STOCK BY 9 DISTRIBUTORS WITH 47 WAREHOUSES IN 39 CITIES IN THE UNITED STATES AND CANADA

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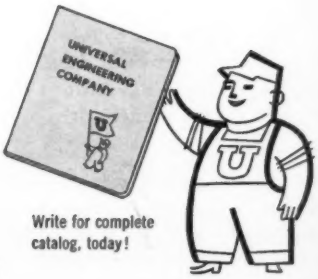
it pays to use UNIVERSAL DRILL BUSHINGS



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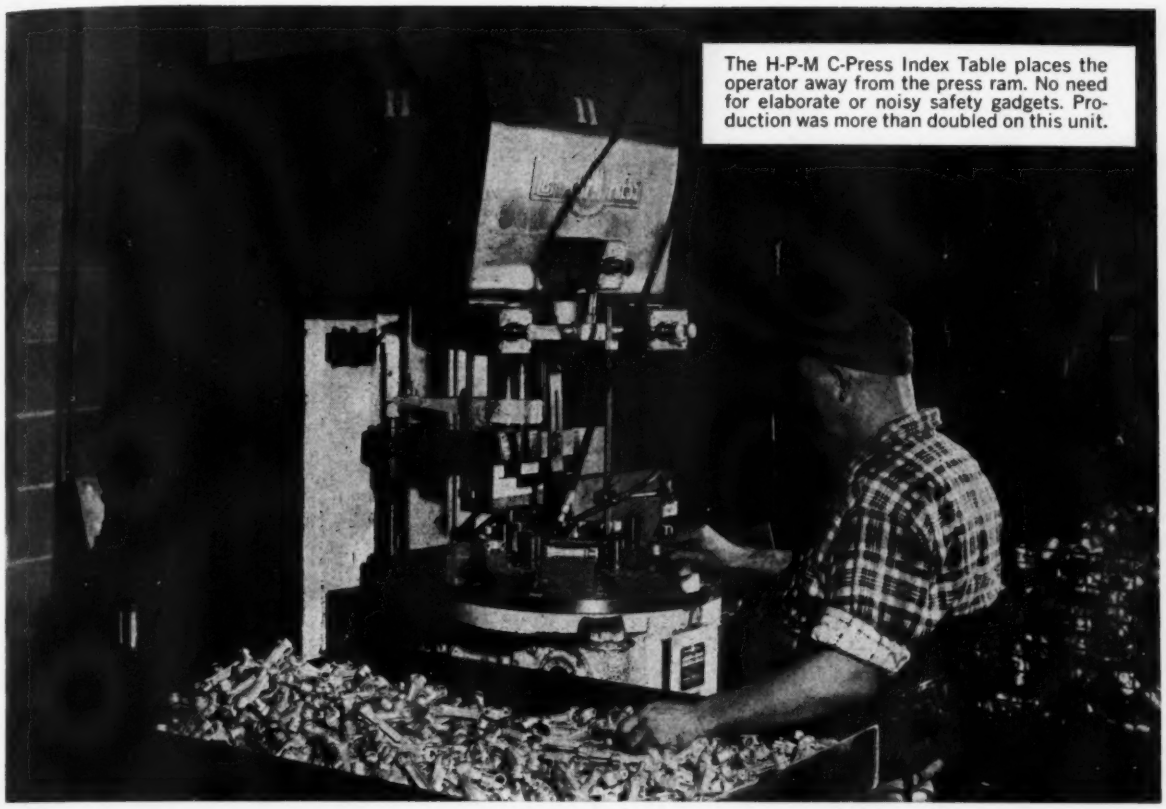
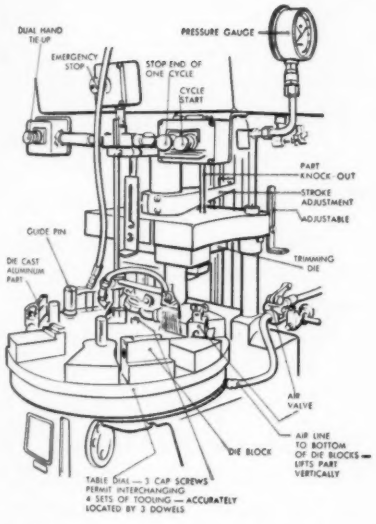
CIRCLE INFORM-A-GRAM KEY NO. 14



The H-P-M C-Press Index Table places the operator away from the press ram. No need for elaborate or noisy safety gadgets. Production was more than doubled on this unit.

H-P-M C-Press with Hydraulic Index Table
BASIC AUTOMATION AT ITS BEST


DUAL HAND TIE-UP
PRESSURE GAUGE
EMERGENCY STOP
STOP END OF ONE CYCLE
CYCLE START
PART KNOCK OUT
STROKE ADJUSTMENT
ADJUSTABLE
GUIDE PIN
DIE CAST ALUMINUM PART
TRIMMING DIE
AIR VALVE
AIR LINE TO BOTTOM OF DIE BLOCKS — LIFTS PART VERTICALLY
DIE BLOCK
TABLE DIAL — 3 CAP SCREWS PERMIT INTERCHANGING 4 SETS OF TOOLING — ACCURATELY LOCATED BY 3 DOWELS

Standard 15-ton C-Press with 6-station index table. 5, 10, 15-ton models with 6, 8 or 12 station tables available. A solid money-making investment for faster, safer metal working.

The job illustrated is tooled for the trimming of die cast parts. Its high-production capacity can be applied to any number of routine production tasks. Look at these versatile features: (1) The index table allows the operator to load parts away from the press ram—in safety and comfort, no wasted waiting time while ram cycles; (2) As many as three operators may be located around this small table for assembly or other operations; (3) Automatic ejection, using air from shop lines makes an effective and time saving contribution to faster production; (4) The die blocks or holding fixtures are located at six stations on this unit. Table dials are dowelled in position for accuracy — may be removed so that different tooling set-ups are replaced in a matter of minutes. Production can be tripled with this type of C-Press.

SAFETY ASSURED WITH C-PRESS METHODS

The operator sits in front of the dial away from moving ram. Fixtures are loaded as they pass his station and are automatically indexed to the next station. Hands never enter the danger zone.

An investment of this type is amortized in minimum time. Want to know more? Write or call H-P-M today. The coupon will assure complete information, immediately.

The Hydraulic Press Mfg. Company, Mount Gilead, Ohio

Please send complete information on the H-P-M C-Press with Index Table. I'd like to triple my production, too.

Name_____ Title_____

Address_____

Company_____

City_____ Zone____ State_____

H20

MMT=PE

HPM

THE HYDRAULIC PRESS MANUFACTURING COMPANY

A Division of Koehring Company • Mount Gilead, Ohio, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 15

CLAUSING COLCHESTER GEARED-HEAD LATHES

Clausing-Colchester 13", 15" and 17" lathes are by long odds the greatest values in lathe history. Note the following outstanding superiorities and rock-bottom prices:

● **WORLD'S FINEST MACHINE TOOL BEARINGS** . . . Tapered roller bearings with oil-flow lubrication. Just look at the size:

LATHE	17"	15"	13"
FRONT SPINDLE BEARING O. D.	7½"	5½"	4"

● **CIRCULAR ACCURACY OF EVERY LATHE IS GUARANTEED TO BE WITHIN .0001"!**

● **BIG SPINDLES WITH LARGER THRU-HOLE CAPACITY:**

LATHE	17"	15"	13"
THRU-HOLE	3"	2"	1½"
NOSE TAPER KEY DRIVE	L-2	L-1	L-0

● **INDUCTION-HARDENED BED WAYS** . . . Standard equipment at no extra cost!

● **ALL-GEARED HEADSTOCK** . . . Gears are induction hardened.

● **OIL BATH LUBRICATED HEADSTOCK and QUICK CHANGE GEAR BOX** . . . both totally enclosed.

● **SEPARATE FEED ROD FOR POWER FEEDS** . . . Lead screw is used for thread cutting only.

● **LOWEST PRICES** . . . The Clausing-Colchester is the biggest lathe value you can find anywhere! The 13" straight bed model starts at $2302; 15"—$3221; 17"—$5070. Gap bed models are available in all three sizes. *Prices include 2-speed motor and American electricals.*

Get all the facts. Compare Clausing-Colchester with any other lathes of comparable size . . . feature for feature, dollar for dollar. Prove to yourself that Clausing-Colchesters are truly the "Greatest Values in Lathe History" . . . *the* lathes for *your* shop!

Write for Free Literature

CLAUSING COLCHESTER

CLAUSING DIVISION
ATLAS PRESS COMPANY
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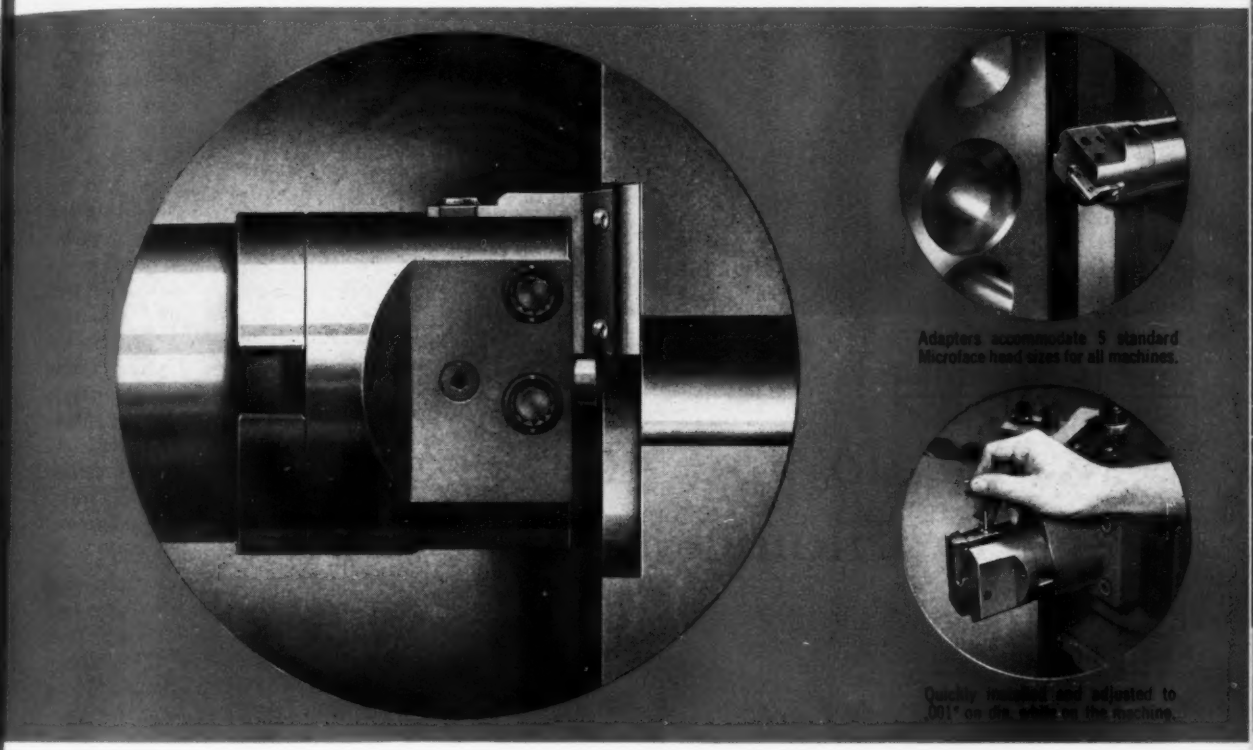
CIRCLE INFORM-A-GRAM KEY NO. 16

NEW FROM **FAIR STREET** • HOME OF MICROBORE

microface®

ADJUSTABLE BLADE FACING HEAD

(Patent Pending)



For boring machines, turret lathes and heavy drilling equipment, this new addition to the Microbore Tooling System bores, faces or spot faces wide surfaces from 1½" to 8½" dia. without special tooling. Often eliminates the necessity of generating faces by slow cross feed methods. Dovetail blade holder mounting in the rugged, one-piece head eliminates chatter, assures consistent accuracy, fine surface finish and prolongs blade life. Adjustment of interchangeable high-speed steel or carbide blades is fast and accurate. *Blades replaceable with a minimum of down time without removing head from the machine.*

MicroFACE
ADJUSTABLE BLADE FACING HEAD
FOR PRECISION BORING AND FACING OR SPOT FACING WIDE SURFACES WITHOUT THE USE OF SPECIAL TOOLING
ESPECIALLY SUITABLE FOR BORING MACHINES, TURRET LATHES, HEAVY DRILLING EQUIPMENT
DeVLIEG MICROBORE

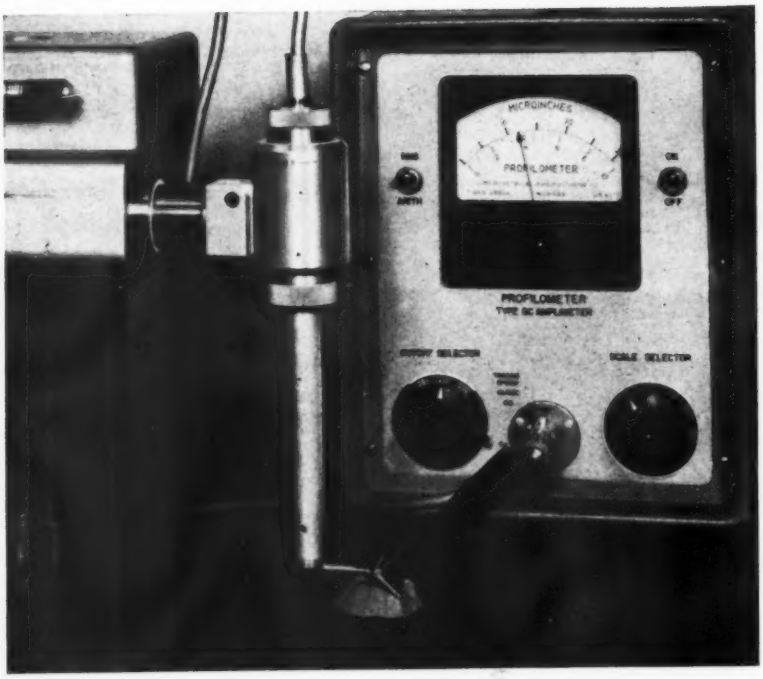
Write for technical 4-page brochure.

DeVLIEG® MICROBORE® SYSTEM

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

Fair Street, Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 17



PERTINENT QUESTION:

WHY do you need the Profilometer®?

FACTUAL ANSWER:

To check practically *all* surfaces against microinch roughness specs —and to help cut production costs in 7 different ways.

FREE BULLETIN LT14 gives details on the Profilometer and its practical applications. May we send you a copy?

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345 S. MAIN ST. ANN ARBOR 6, MICHIGAN

Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER®, WAVOMETER®, ANDEROMETER®, VAROMETER®, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Month's Talk from page 12

urement also make possible the detection of flaws and disconformities in material normally difficult to examine. Comparatively low sonic power is adequate for nondestructive testing devices. Therefore, they are almost exclusively piezoelectric or crystal transducer systems.

Hard-Substance Machining

In hard substance machining (impact grinding), a cutting tool is driven at sonic frequencies by a transducer. Because of the energy levels involved, most of these devices use magnetostrictive transducers. Abrasive particles in a liquid slurry are maintained between the cutting head and the surface of the material being cut.

These particles are propelled against the substance being worked with such force that they will quickly grind their way into very hard substances, and reproduce the form and profile of the cutting tool. Because this is in a sense a nonrotating drill, irregular shapes can be cut. Tolerances of 0.001" are easily attained, and heat caused by drill friction is generally eliminated as a factor for consideration.

Metals Joining

Metals joining is accomplished by applied pressure through a sonically activated welding tip. Heat generated by the friction created between the two metals being joined causes a fusion at the interface. Currently, sonic energy is used for a limited number of spot, butt, and seal welds. Examples of good applications are the welding of fine wires and metal foils and the welding of foils to heavy gauge metals.

Sonic-Energy Cleaning

In sonic-energy cleaning, secondary phenomena in the form of cavitation contribute another dimension to the application of sound waves. This is readily illustrated by citing the fact that in any liquid medium there are many thousands of bubbles. These range in size from bubbles large enough to see to submicroscopic interstices which appear throughout the liquid or at the surface of a material immersed in the liquids.

When a sound wave is sent

. . . Continued on page 21

Thor

Everything you want in Multiple Nut Setters...

and more!

Speed production, multiply profit on any assembly of two to twenty-two nuts or screws. Thor multiples are custom engineered to your exact assembly situation. All fasteners are secured simultaneously to identical torque. Thor multiples can be engineered for any pattern, any product. Thor multiples are now in use in the assembly of such widely diversified products as floor mops and carburetors. Write today for Thor's complete automation manual on multiple fastener settings.

Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

Thor POWER TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 19

Six Ways to Save... ON ALUMINUM BRONZE WEAR STRIPS AND WEAR PLATES

MEET JACK: A fictitious character we have chosen to illustrate a non-fictitious story

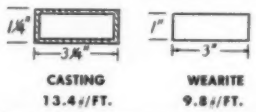
LENGTH

Jack needed 4 rectangular wear strips, each 36″ long. Always before, he ordered 8 castings, each 18″ long and had to splice them together. NOW . . . Jack has found out about MEIER WEARITE EXTRUDED ALUMINUM BRONZE RECTANGLES and how it comes in any length up to 10 feet long, so he specifies the exact length.

AVAILABILITY

Jack used to have to wait 2 or 3 days for castings, since that is the usual required time to have them made up. Now Jack orders Wearite and gets it right off the shelf of the local distributor, which saves him time.

SIZE (On a 1X3 wear plate, for example)

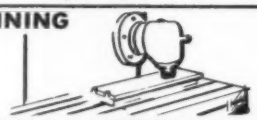


There was a time when Jack would have to order his castings oversize and machine them down to the required size. Jack did this to get rid of the sand inclusion which was around the surface. "Why wear out good cutting tools to remove excess scrap" Jack reasons. "With Meier Wearite little or no 'cleanup' work is required, and I can choose from *94 different sizes* of stock."

QUALITY

Jack has found out since he has switched to Wearite that the new metal is a "quality" metal. WEARITE EXTRUDED RECTANGLES are produced from semi-continuous cast billets under the strictest of laboratory control. This makes them tough and longer lasting.

MACHINING



When machining is required, Jack has found that he prefers the Wearite to castings. Extruded metals are free from porosity and have a homogenous structure; this makes Wearite easier to machine.

COST

But what makes Jack really happy . . . REALLY, REALLY happy . . . is that besides all of these advantages he has found that pound for pound of usable metal MEIER WEARITE EXTRUDED ALUMINUM BRONZE RECTANGLES COST LESS!

SEND FOR FREE CATALOG and SAMPLE TODAY

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BRASS & ALUMINUM
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Distributor inquiries invited

CIRCLE INFORM-A-GRAM KEY NO. 20

...Month's Talk from page 18

through the liquid, it will subject the bubbles in its path to compressional forces (sound waves are compression waves). This force will cause many of the bubbles to collapse, leaving a void in the liquid. The surrounding liquid driven primarily by hydrostatic pressure, atmospheric pressure and surface tension will rush to fill these voids. This produces up to 1,000 atmospheres of pressure at the locus of the imploding bubble. This fantastic pressure contributes an action to the liquid not available by any other means. Because this action occurs millions of times a minute, the phenomena are described in layman's language as "millions of scrubbing fingers at work."

Sonic-energy cleaning is particularly effective because it can reach any surface of the part which is wetted by the cleaning medium, regardless of its geometric configuration. As an example the following specific cases are cited:

The problem was removing of grinding grit. The former cleaning method was hand scrubbing with naptha and air blowing. Fifteen percent of the parts required rework due to ineffectual cleaning.

The parts are now sonically cleaned in a 3-min cycle, using water and detergents. As a result, rework due to ineffectual cleaning is eliminated. Cleaning time is reduced by two-thirds and flammable and explosive solutions are no longer necessary.

The problem was removal of shop soil, metal chips, and oil from all surfaces, including blind holes, of cast aluminum bodies of 4-barrel and 2-barrel carburetors.

The parts are now cleaned sonically in a water detergent solution for 2 min. A sonic energy unit capable of cavitating 30 gal of solution achieves a rate of 480 four-barrel carburetors or 720 two-barrel carburetors/hr. Evaluation using radioisotope techniques confirmed removal of all chips, shop soil, and oil from all blind holes and channels, as well as from exterior surfaces. Calculated savings are cleaning solution, 92%; direct labor, 45%. Malfunctions due to contamination were eliminated.

. . . Continued on page 24

ASSEMBLE PARTS FASTER . . . WITH FEWER REJECTS!

PEDESTAL TYPE

SELF-CONTAINED DRIVING HEAD

DPS model U power screwdriving machines

- Maintain constant driving torque with new positive control clutch
- Dependable motorized hopper drive with safety clutch protects motor and gears in the event of jamming
- Release screw by body or head with new feed track and escapement mechanism

Write today for DPS Model U Bulletin

You can drive up to 40 screws per minute with a DPS Model U. Nuts are driven equally fast . . . with accuracy that cuts parts waste, improves assembly quality.

DPS offers the Model U in two types: pedestal, and self-contained driving head. Both require minimum space and are readily adaptable to your work flow. Feed track and escapement mechanism mounts on either side of the machine column for right- or left-hand assembly. The versatile self-contained driving head is ideal for use in automatic assembly machines incorporating dials and straight-line transfers.

The Model U drives screws from #6 x 3/16" long to 1/4" x 1 1/2" long . . . and can be equipped with 12" or 16" barrel feeders.

DETROIT POWER SCREWDRIVER COMPANY

2827 W. Fort St. • Detroit 16, Michigan
A Subsidiary of Link-Belt Company

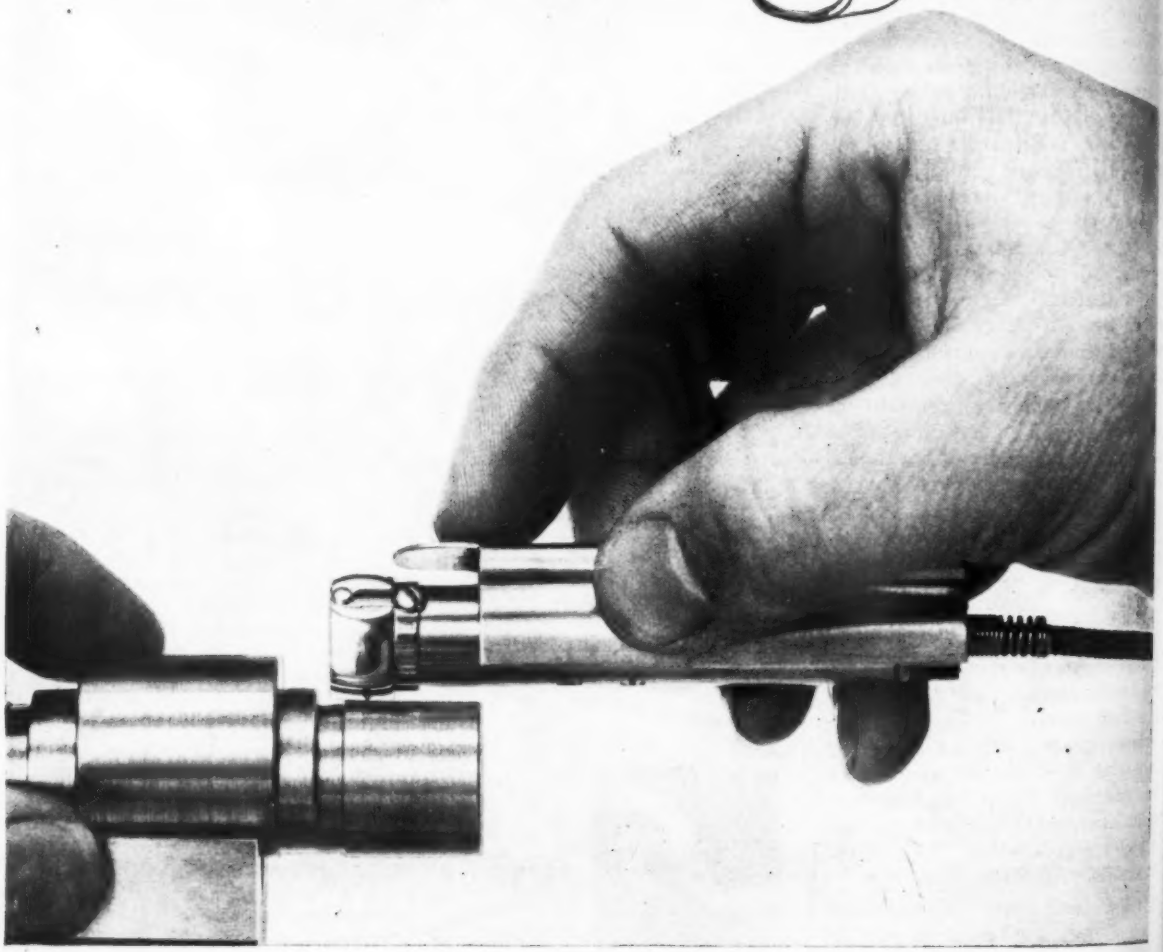
15,334

CIRCLE INFORM-A-GRAM KEY NO. 21

GET TRUE READINGS ON FINISHES EVERYTIME, EVERYWHERE WITH SURFINDICATOR

Job to job, plant to plant, *every* Brush Surfindicator gives true and identical readings from 0 to 1000 microinches on the same surface. Precision reference standard comes with every unit; makes field calibration simple and eliminates need for factory adjustment. The Surfindicator is immune to magnetic fields, vibration, line voltage variations; weighs but 15 pounds and is completely self-contained. **The Brush Surfindicator Complies Completely With ASA and MIL Specs. See For Yourself. Request A Demonstration.**

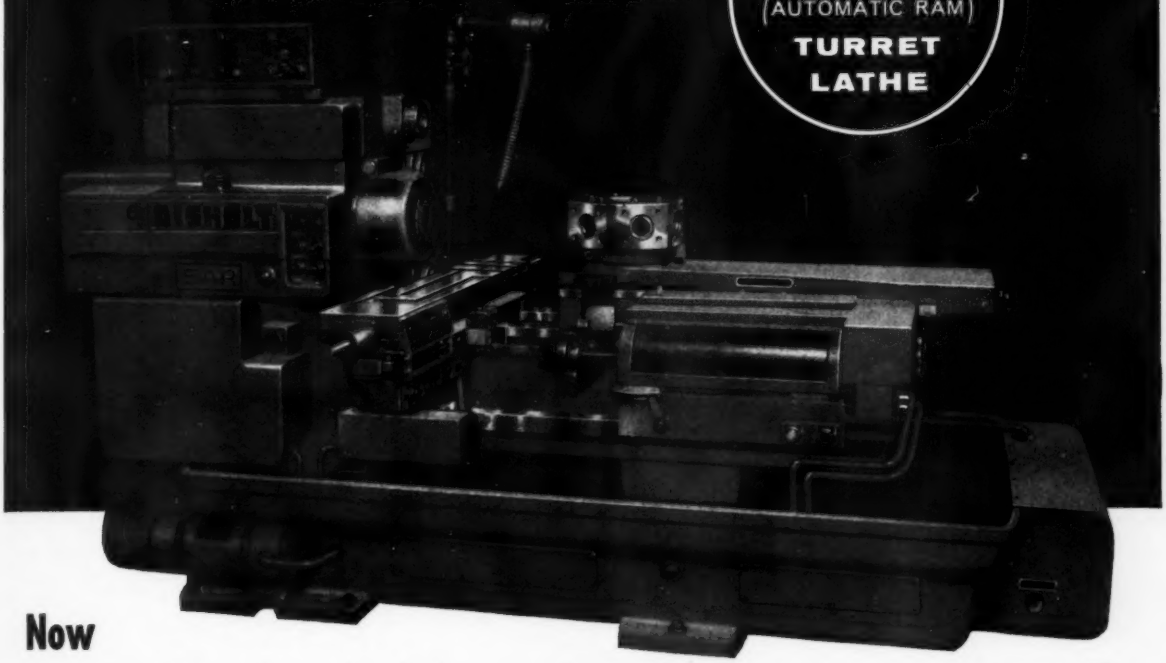
brush INSTRUMENTS
DIVISION OF
37TH AND PERKINS CLEVITE CORPORATION CLEVELAND 14, OHIO



CIRCLE INFORM-A-GRAM KEY NO. 22

ANNOUNCING

the new GISHOLT AR (AUTOMATIC RAM) TURRET LATHE



Now one machine does both bar and chucking work... automatically

Here is a ram-type turret lathe "gone automatic." It's the new Gisholt MASTERLINE AR. It handles both bar and chucking work. Changeover takes less than 1 hour. But that's not all. It combines the efficiency and consistent production of an automatic with fast setup and versatility. Yet, the new AR costs very little more than a hand-operated turret lathe!

For long runs or small lots. Whether you are now using automatics for long runs, or standard ram-type turret lathes for small lots, you'll want to evaluate this new development in automatics. You will quickly see how the new AR will cut your costs. Based on productivity, capacity, versatility, dependability, ease of operation, setup speed and original cost, you'll find it's a new best buy for your equipment dollar today!

Ask for desk-side demonstration. Your Gisholt Representative will gladly explain the cost-cutting features of the new AR and show you how it can boost profits for you. Ask for your personal, desk-side demonstration or write for literature.

Investigate Gisholt's Extended Payment and Leasing Plans

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

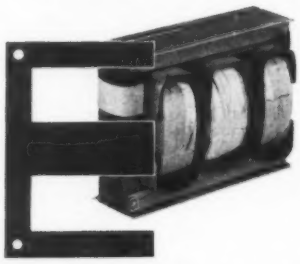
Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • *Factory-Rebuilt Machines with New-Machine Guarantee*

CIRCLE INFORM-A-GRAM KEY NO. 23

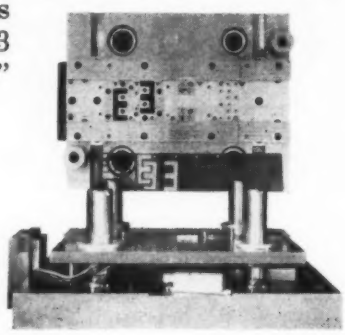
Cleveland Tool and Die
CASE FILE

"12 to 15 times longer die life"

CTD PRECISION CARBIDE DIES SPEED OUTPUT OF "FRANCEFORMER" LAMINATIONS



Check the transformer on the next neon sign you see, and chances are it'll read "Franceformer"—trade mark of the France Mfg. Co. of Cleveland, O. This aggressive company supplies leading jobbers of neon signs throughout the country. For high-speed lamination production, France chooses CTD precision tungsten carbide dies. "CTD dies give us continuous production with far less downtime", says Emil Olds, plant manager. "We get 12 to 15 times the die life at only 3 times the previous cost."



Another example of the important production efficiency made possible by CTD precision craftsmanship

Cleveland Tool and Die *means precision...*

Dies, Jigs, Fixtures and Special Purpose Tooling

Send for brochure describing CTD's plant and facilities. **FREE!**

Cleveland Tool and Die Co.
30510 Lakeland • Willowick, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 24

. . . Month's Talk from page 21

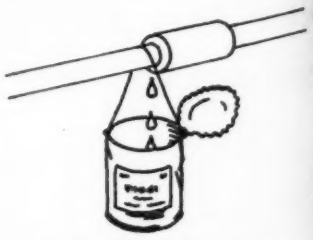
In another instance, the problem was production cleaning of a precision gear assembly, including removal of metal oxides, machining compounds and metal particles.

The parts are now processed in sonic energy for 2 min in a water detergent and ammonium hydroxide solution.

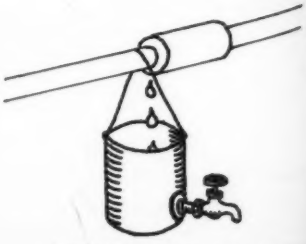
As a result, rejects due to contamination previously averaging 56% were eliminated, effecting savings on rework and scrap totalling $28,240 annually. Two inspectors were eliminated from the line and the use of a toxic solution (trichloroethylene) was eliminated.

In summary, many wonderful feats are being accomplished through sonic energy, but a clear distinction must be made between experimental and production applicable results. If the four practical aspects of sonic energy — nondestructive testing, hard-substance cutting, sonic-energy cleaning, and metals joining — are considered as available production tools and not as a panacea, many practical advantages can be gained on the production level.

Shop Talk



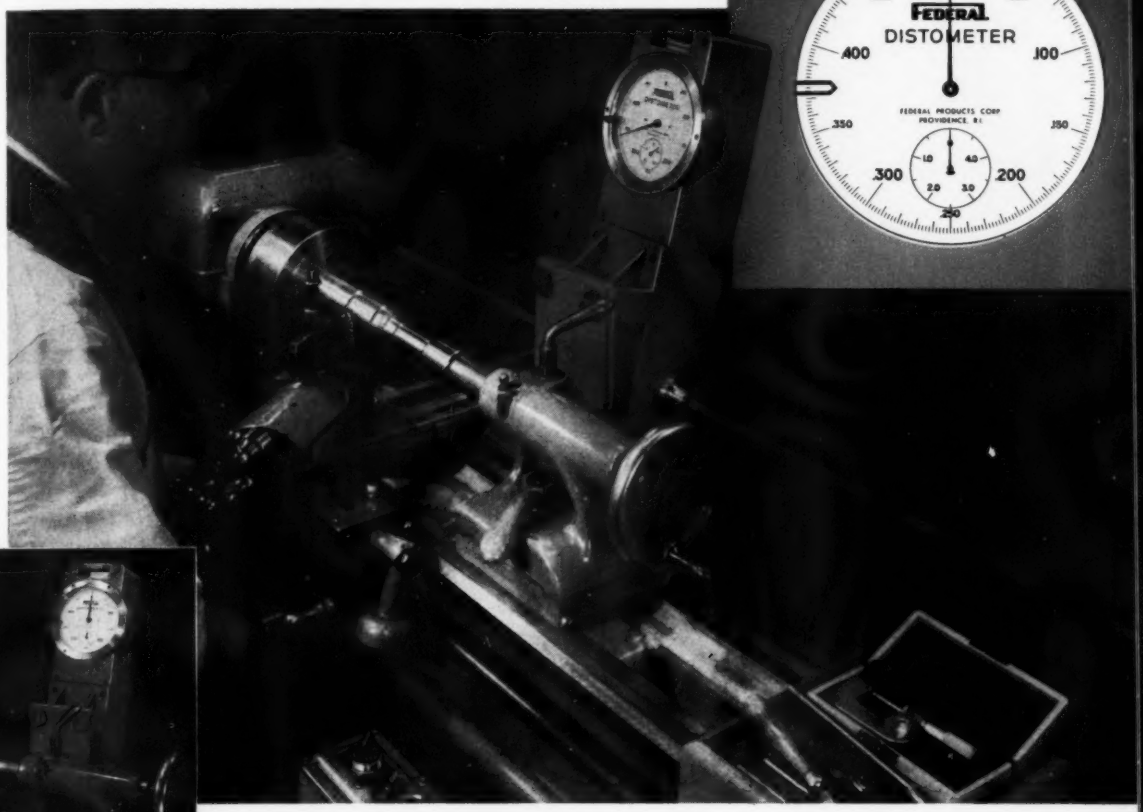
TEMPORARY HYDRAULIC LINE REPAIR.



. . . PERMANENT REPAIR.

Right before your eyes...

A 27% (or more) INCREASE in LATHE PRODUCTIVITY!



Push-Button Zeroing . . . you're instantly and automatically ready to measure off the next distance.

The DISTOMETER, a totally new precision instrument, greatly increases lathe output . . .

Because —

- It provides a much faster, more convenient and more reliable means of spotting tool position and measuring longitudinal cutting distance than any other available device.
- It has motorized, Push-Button Zeroing. Lets you reference instantly at any point in the carriage travel for continuous measurement to any other point.
- It puts accurate, well magnified, man-size readings in front of the operator so he can follow progress of the tool and know instantly when it has covered the required distance.
- It requires no set up, no positioning, no mastering. Ready to measure *directly* at the touch of a button.

ANY MANUALLY OPERATED LATHE . . . OLD OR NEW . . . BIG OR SMALL . . . CAN USE THE DISTOMETER PROFITABLY!
Write for brochure.

FEDERAL PRODUCTS CORP.
6236 Eddy Street, Providence 1, R. I.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .
Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

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CATERPILLAR REPEATS WITH HAMMOND ELECTROLYTIC GRINDERS

3 purchased in 1957
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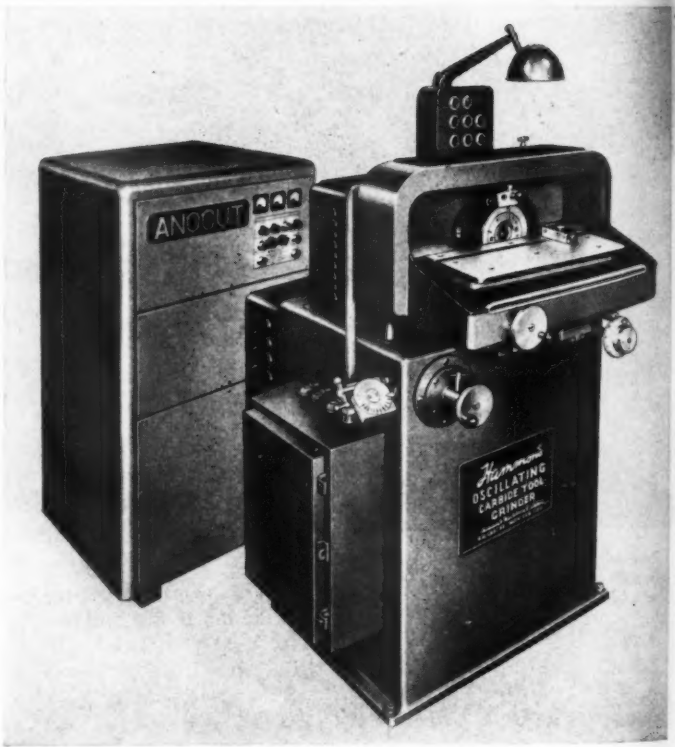
Why have Caterpillar Tractor Co. and many other leading manufacturers "repeated" and found Hammond Electrolytic Grinding the lowest cost, easiest and fastest carbide tool grinding ever experienced?

- Faster stock removal and finish grind time reduced.
- *No heat fractures* as process is cold.
- *Large savings* in diamond wheel consumption.

Hammond Electrolytic Grinders are the "biggest news" in carbide tool grinding today. Many installations paid for themselves in just a few months.

You are interested in reducing costs, so why not send us a few single-point tools to be ground? They will be returned promptly with "processing and time required report." There is no obligation.



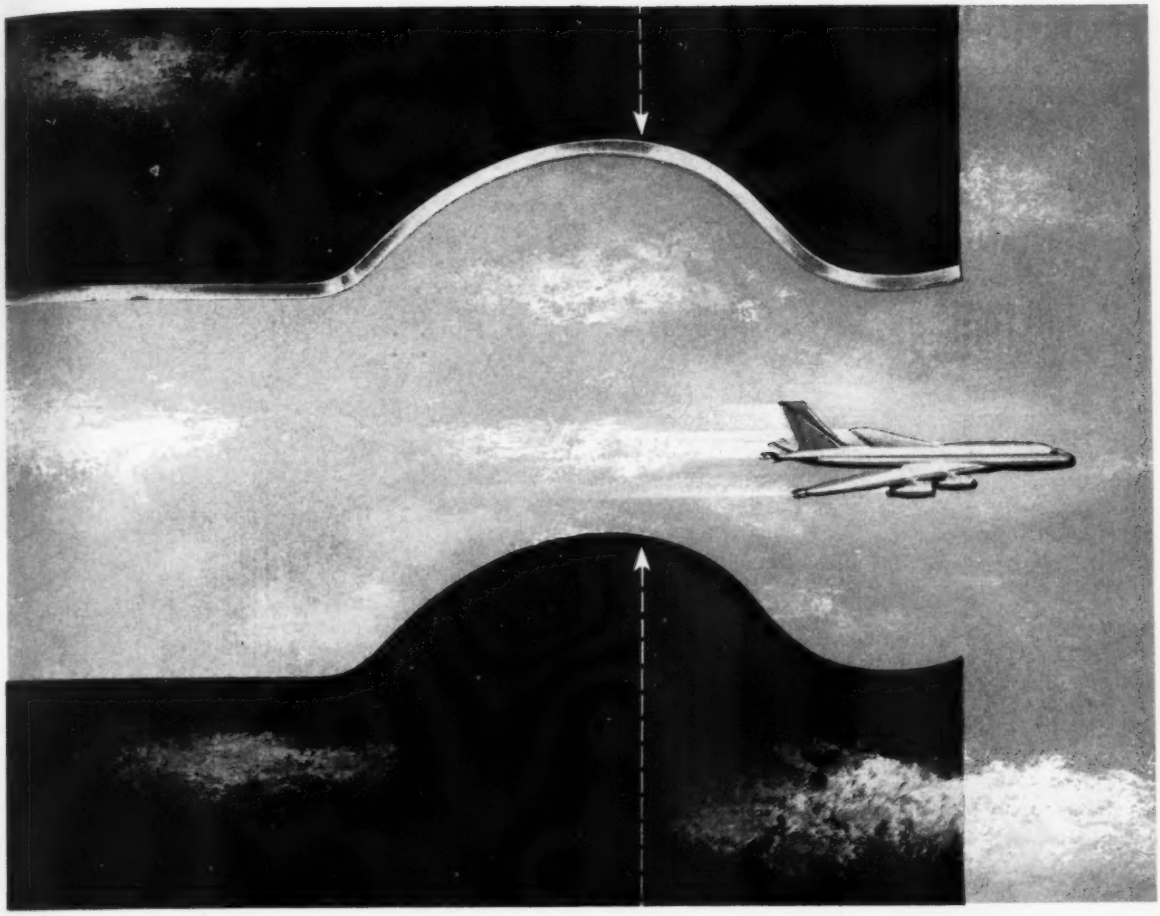
Write for Catalog Today

Hammond's OF KALAMAZOO "Good Machinery Since '82"

Hammond Machinery Builders INC.

1631 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 26



Want to save with plastic tools and dies?

Your EPON® RESIN tooling formulator can help you

Tools and dies made of tough but easy-to-handle Epon resin can save you up to two thirds in time, one third in cost! Your tooling resin formulator will show you how Epon resin formulations are saving time and money—*right now*—in applications such as:

High-temperature tooling: Metal-forming stretch dies that can operate at temperatures over 400° F.

Heated tools: Matched dies, with integral heating units, may be made with Epon resin formulations for rapid heat-curing of laminated plastic parts.

Long-lasting metal-forming tools: Castings made of formulated Epon resin, mounted in a crank press, showed no permanent deformation after 28,000 compression-shock cycles.

For tool and die applications, Epon resin formulations offer you the following important advantages:

Excellent tolerance control: Little machining and handwork are required to finish Epon resin tools because of the material's excellent dimensional stability and lack of shrinkage.

Outstanding strength: Jigs and fixtures with thin cross sections can be built from Epon resin-based formulations reinforced with glass cloth. The resulting laminate has high flexural strength and excellent dimensional stability.

Easy modification: Tools and fixtures made from Epon resins may be quickly and easily modified to incorporate design changes.

CONTACT YOUR TOOLING RESIN FORMULATOR

The combination of resin formulator's skill and application knowledge, backed by Shell Chemical's research and resin experience, has solved many important tooling problems for industry. For a list of experienced tooling resin formulators and additional technical information, write to:

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PLASTICS AND RESINS DIVISION
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6056 West Touhy Avenue
Chicago 48, Illinois

East Central District
20575 Center Ridge Road
Cleveland 16, Ohio

Eastern District
42-76 Main Street
Flushing 55, New York

Western District
10642 Downey Avenue
Downey, California

IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited, Toronto

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CIRCLE INFORM-A-GRAM KEY NO. 27

HARDINGE
ELMIRA, N.Y.

70TH ANNIVERSARY
1890 - 1960
HARDINGE
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ACCURACY
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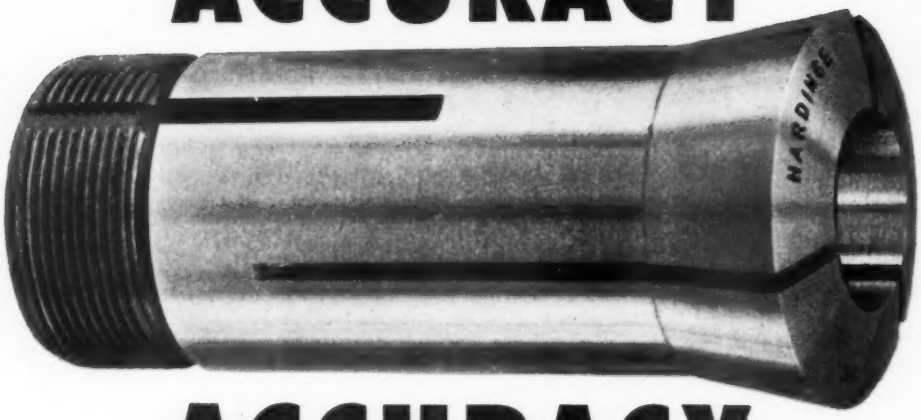

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HARDINGE has specialized in the manufacture of collets since 1890.
HARDINGE today stocks collets in sixteen principal cities in the United States and Canada.
Ask for descriptive bulletins.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

CIRCLE INFORM-A-GRAM KEY NO. 28

Lower your per unit stamping cost with **AUTOMATIC PRODUCTION**

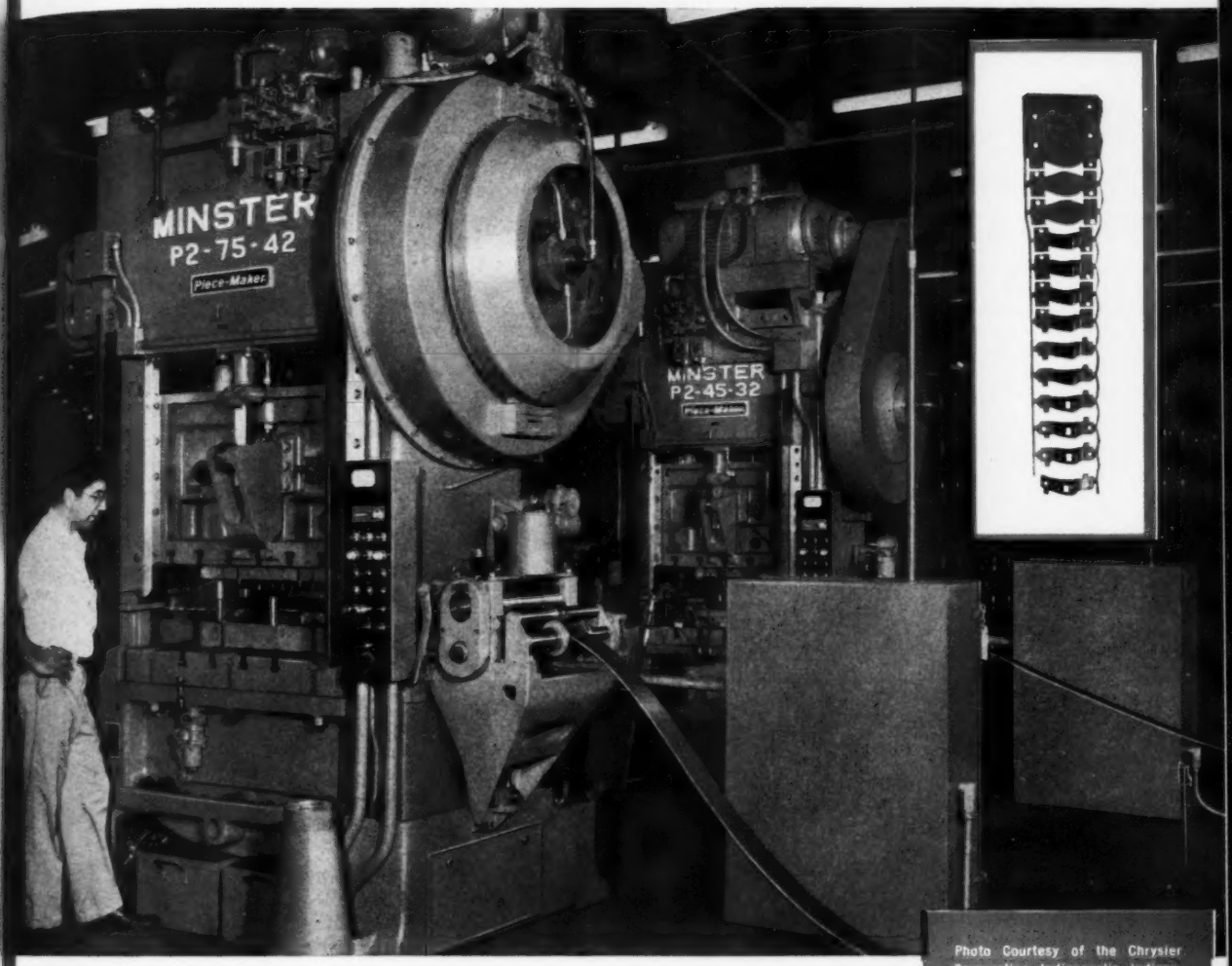


Photo Courtesy of the Chrysler Corporation, Indianapolis, Indiana.

Minster Piece-Maker automatic production presses are designed for rigidity and built with precision. From 20 to 300 ton capacity.

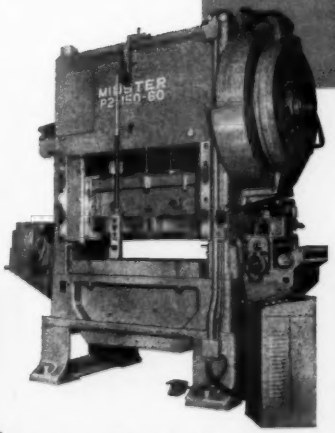
Minster *Piece-Maker*® Presses

You get more parts per hour at a lower unit cost when you produce stampings automatically. Costs shrink as you eliminate expensive rehandling and storage of parts between operations.

Minster offers a complete range of press types and sizes for all kinds of profitable automatic production . . . long runs, short runs, big parts or tiny parts.

The right Minster press, with feed equipment matched to both press and job, can lower your unit costs, give you maximum productivity. Want more facts? Write or call us today.

The Minster Machine Company • Minster, Ohio



MINSTER®

CIRCLE INFORM-A-GRAM KEY NO. 29

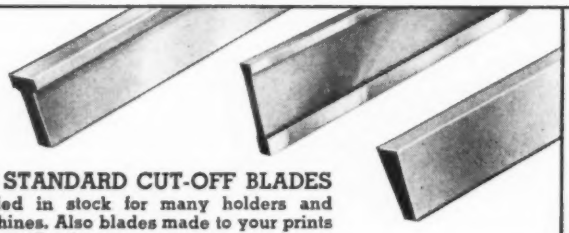
O-KNI-CO MACHINE TOOL news

PRODUCTION FACTS THAT INCREASE YOUR PROFIT

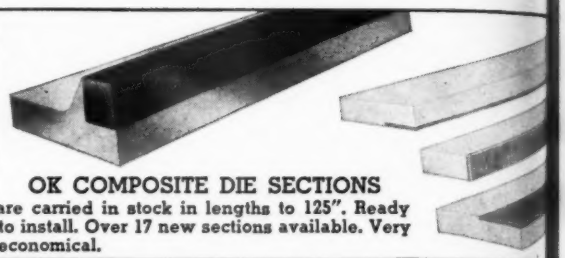
PUBLISHED BY THE OHIO KNIFE CO., CINCINNATI, OHIO

MANY COMPANIES NOW CUTTING PRODUCTION COSTS — INCREASING MACHINE LIFE AND ACCURACY WITH THESE OHIO KNIFE CO. HARDENED PRODUCTS

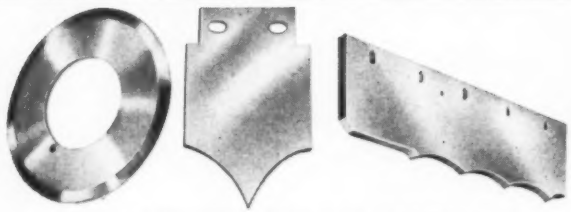
The products shown here are just a few of hundreds made by The Ohio Knife Co. of Cincinnati, Ohio. They are widely used as components by machine builders and as replacements when ordinary parts wear or break. The Knife Co. is internationally famous for their special hardening techniques, resulting in a reputation for producing products with long wear qualities. Many products are made by bonding high speed steel, tool steel or alloy steel to a mild backing. This gives the finest wear resistant surface possible. Perfect bonding is assured through use of a 12 ton forging press and rolling mill. Other products are especially hardened to meet the requirements of the job. All products are meticulously ground to extremely close tolerances. Specific bulletins are available FREE on all products.



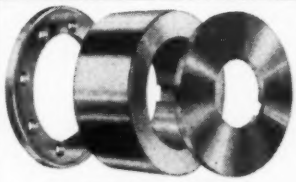
OK STANDARD CUT-OFF BLADES
carried in stock for many holders and machines. Also blades made to your prints or specifications.



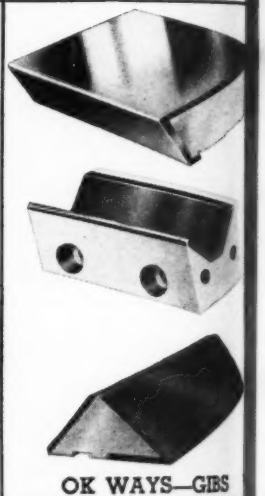
OK COMPOSITE DIE SECTIONS
are carried in stock in lengths to 125". Ready to install. Over 17 new sections available. Very economical.



OK TUBE CUT-OFF BLADES
widely used in the manufacture of welded tubes.

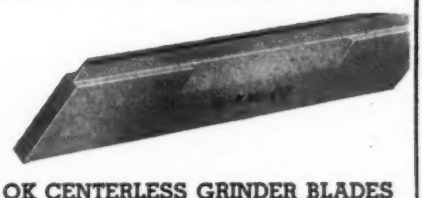


OK ROTARY METAL SLITTING KNIVES AND SPACERS
in a complete range of sizes.

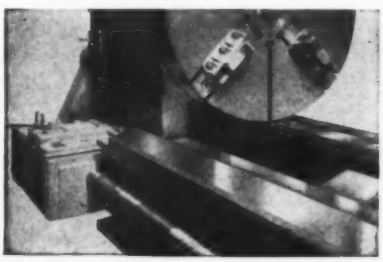


OK WAYS—GIBS
are practically wear-proof. Also available in aluminum bronze. Complete selection

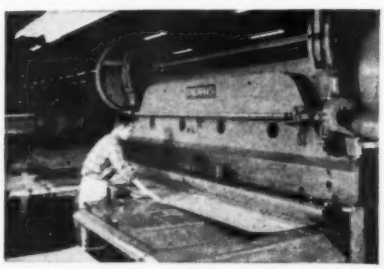
OK SOLID STEEL SHEAR BLADES
for all types shears and any type of shearing requirement.



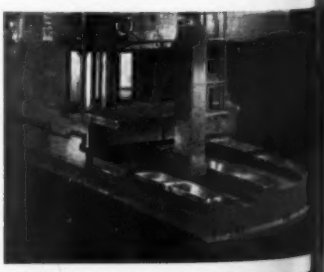
OK CENTERLESS GRINDER BLADES
Complete range of sizes and designs carried in stock for quick delivery.



O-KNI-CO processed hardened ways on 60 inch lathe made by The Niles Tool Works.



65 ton Cincinnati Press Brake equipped with long-wearing O-KNI-CO processed shear blades.



O-KNI-CO hardened bedways, cross ways on a G. A. Gray Co. horizontal boring machine.

FREE BULLETINS AVAILABLE • THE OHIO KNIFE CO., DEPT. 110-LL • CINCINNATI 23, OHIO

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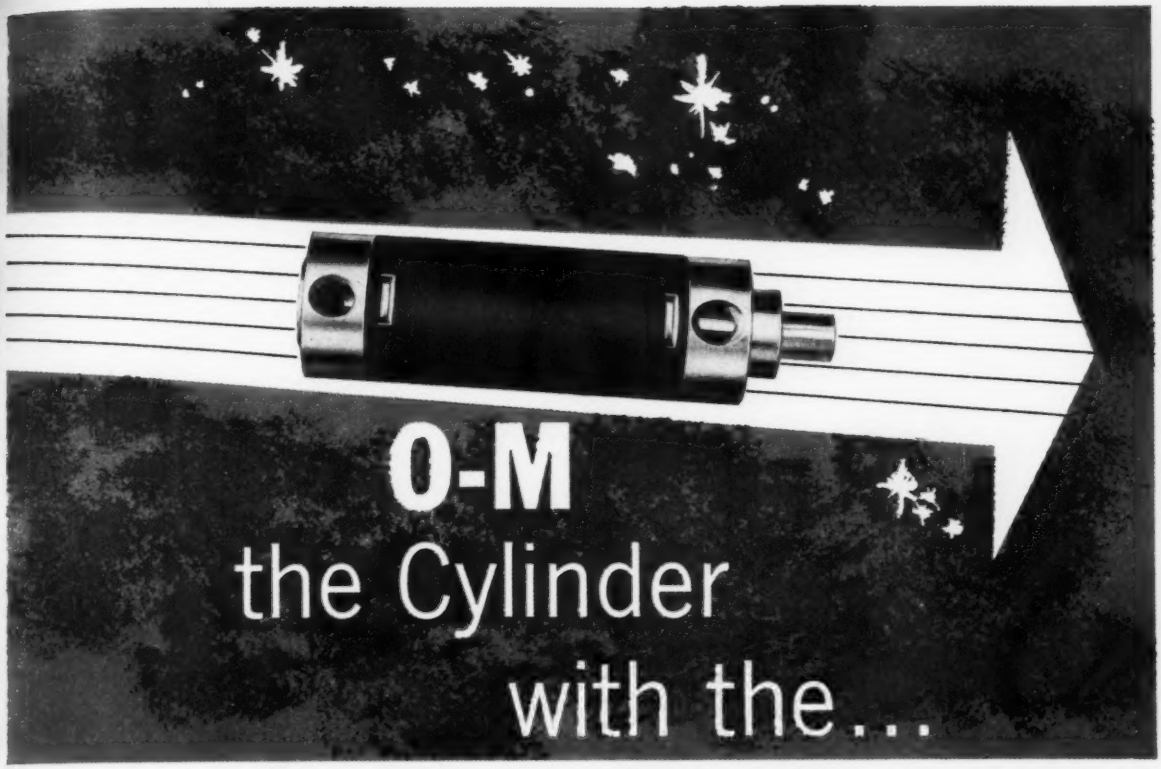


Guided Stroke

INTERNAL KEY TIE-RODLESS-TYPE SERIES 101A

Air 150 psi—Hydraulic up to 1500 psi
Fits where others won't
Meets JIC Standards, Bulletin 101A

WHEN a piston rod must hit right on the button to feed a work piece, activate an indexing table, push, pull, raise, lower, knock-out or clamp, you can count on an O-M Guided-Stroke Cylinder everytime. And there's no mystery about it, just top-level O-M precision workmanship, the latest and best machine tools, modern design, plus years upon years of engineering "know-how." And it's all spelled out with construction and performance details, engineering drawings as well as a capacity chart in each of our latest Bulletins.

Write for your copy TODAY. See why O-M Air and Hydraulic Cylinders maintain perfect rod alignment, make full-power starts, are designed right to seal right, have the lowest coefficient of friction and many other advancements.

Bulletin 101A for Internal Key Tie-Rodless-Type Air and Hydraulic Cylinders featured above.

Bulletin 105A—Improved Tie-Rod (Heavy Duty) Cylinders Hydraulic 2000 psi; 3000 psi non-shock.

Bulletin 107—Automation (Heavy-Duty) Air Cylinder for 200 psi operation.

Bulletin 108—Automation (Heavy-Duty) Hydraulic Cylinder—for 1000 psi operation.

All O-M Cylinders are available in ½" to 8" bores with standard, oversize, or heavy-duty rods. Complete line of mounts and interchangeable parts. Immediate delivery on most sizes. MAIL COUPON TODAY.

ORTMAN-MILLER MACHINE COMPANY
21 143rd Street, Hammond, Indiana

☐ Have representative call

Send Bulletins

☐ 101A ☐ 107
☐ 105A ☐ 108

NAME_____ POSITION_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 31

HOUR OF DECISION

After hours? — sure You're not surprised at that because you know it's when he (and probably you, too) concentrates on the problems which are vital to his company's continued successful growth. The day is filled with production crises, maintenance problems, personnel questions, and committee meetings. It's only now that he can really study the facts and decide what's best.

Right now he's reviewing his machine tool inventory. He's amazed at how old some of his equipment is getting to be. It seems only yesterday that he signed the purchase order for it to increase his capacity for World War II. But that was 1943, seventeen years ago! No wonder maintenance is getting high and efficiency is dropping off.

We've got a suggestion for this man (and for you, too). Attend THE MACHINE TOOL EXPOSITION — 1960 and see for yourself why Modern Machine Tools = Production Efficiency. This exhibit, the first since 1955, is sponsored by The National Machine Tool Builders' Association* and will contain eleven acres of the U.S.A.'s newest machine tools under power, cutting and forming metal to demonstrate 1001 ways to lower production costs. Can you afford to stay home?

You're also invited to the PRODUCTION ENGINEERING SHOW on the Navy Pier.

No extra registration needed.

*The N.M.T.B.A. represents 90% of the U.S.A. machine tool industry.

FORMULA FOR TOMORROW

MODERN MACHINE TOOLS — MMT=PE — PRODUCTION EFFICIENCY

International Amphitheatre
Chicago, Illinois
Sept. 6-16

CIRCLE INFORM-A-GRAM KEY NO. 32

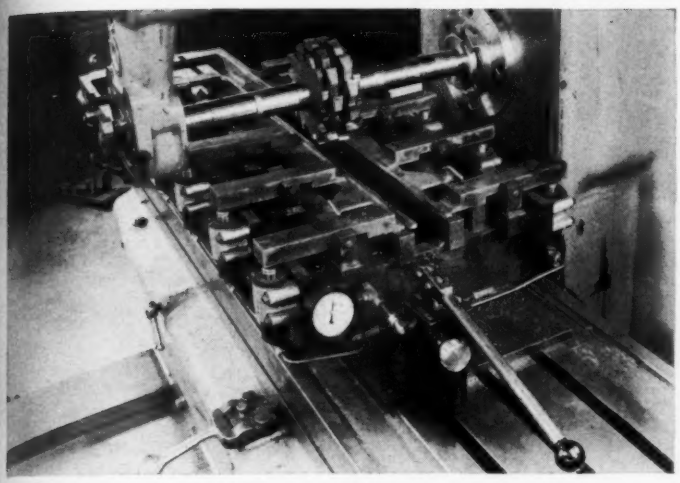
THE MACHINE TOOL EXPOSITION — 1960

For information write to

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

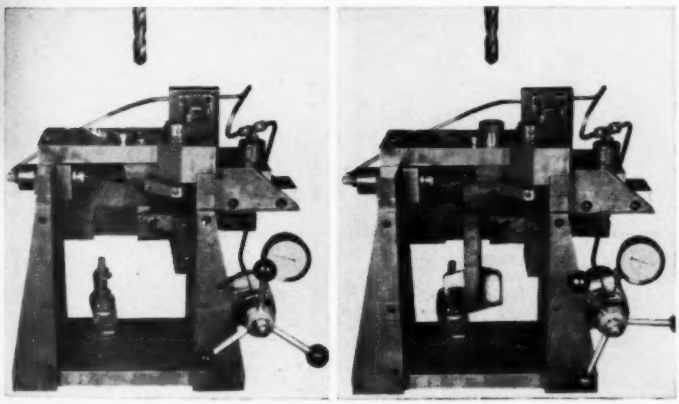
2139 Wisconsin Avenue, N.W. • Washington, D. C.

How other shops clamp down on loading time...



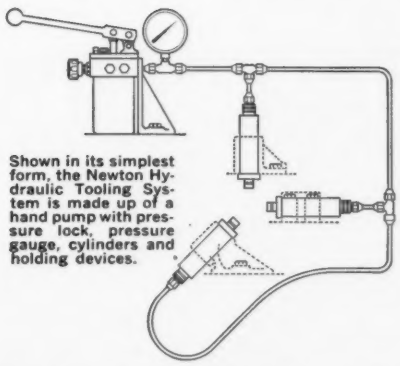
TRIANGLE PACKAGE BOOSTS PRODUCTION 335% . . .
reports Michael Zolnierczyk, Triangle Tooling Supervisor. Former floor-to-floor time, using mechanical clamping, averaged 57 minutes per piece or over 142 hours per 75 pairs. With Newton Hydraulic System, average floor-to-floor time has been cut to 17 minutes per piece, or 42 hours per 75 pairs, including set-up time. "The above figures," states Mr. Zolnierczyk, "represent a saving of 40 minutes per piece part, which is a production gain of 335%." Photo above shows Newton Hydraulic Tooling System installation machining fragile guide rails for conveyor system of meat packaging machine.

(The Triangle Package Machinery Company, Chicago, Illinois, manufactures filling, packaging and wrapping machines of particular importance to the food industry.)



R & H MACHINE SERVICE CLAMPS ODD-SHAPED PARTS RAPIDLY . . .
according to Robert Miller, Chief Engineer, who says: "The new Newton Hydraulic Clamping System is readily applied to a drilling jig for an odd-shaped casting, which would be awkward to clamp by other methods. Shown above are views before and after the part is positioned for drilling." Adds Mr. Miller, "Clamping and unclamping are far more rapid than would be possible with manual clamps. Pressure is uniform regardless of small variations in the size of castings or parts. Economy is another advantage. All the units, with the possible exception of some of the piping, can be used over again on other jigs and fixtures."

(R & H Machine Service, Cincinnati, Ohio are special machinery and tool builders.)



Shown in its simplest form, the Newton Hydraulic Tooling System is made up of a hand pump with pressure lock, pressure gauge, cylinders and holding devices.

Newton Hydraulic Clamping can speed up your production, too . . . . .

Newton System permits rapid operation of clamps in jigs and fixtures in a matter of seconds compared with the minutes lost by mechanical clamping. System consists of actuating pump feeding a number of clamping cylinders with hydraulic fluid under pressure. Extremely versatile, any number of cylinders usable up to pump's capacity. Various clamping positions facilitated. Pre-determined line pressures up to 2500 psi, are rigidly controlled. System provides easy, safe operation in confined work areas. Entirely self-contained unit. Screw or lever pumps, equipped with pressure locks, available in 2 sizes. Cylinders in varied size ranges. Hydropneumatic intensifiers also available for utmost clamping speed.

HYDRAULIC SYSTEM ASSURES:

- **Maximum reduction in clamping time**
- **Multiplicity of clamping positions**
- **Fast clamping of odd-shaped parts**
- **Controlled clamping pressures**
- **Decidedly safe, economical operation**
- **Movable self-contained units — independent of outside power**
- **Wide range of pumps, cylinders, and mounting devices**

A Newton engineer will be pleased to show you the efficiency and economy found in hydraulic clamping. Simply fill out and mail the coupon below.

NEWTON
HYDRAULIC TOOLING CO., INC.
AUBURN, MASSACHUSETTS

NEWTON HYDRAULIC TOOLING CO., INC., AUBURN, MASS.
I would like more information about Newton Systems.
☐ Send literature ☐ Send representative
NAME & TITLE:_____
COMPANY:_____
ADDRESS:_____
CITY:_____ STATE:_____

CIRCLE INFORM-A-GRAM KEY NO. 33

ANOTHER TALIDE CASE HISTORY . . .

Talide® Dies Cut Maintenance Costs at REVERE COPPER!

REVERE COPPER & BRASS, INC., ROME, NEW YORK, producers of copper clad, stainless steel kitchenware

found aluminum bronze dies gave better production than steel alloy dies, but maintenance costs still remained high. Over 500,000 one-quart sauce pan bodies were being drawn with each aluminum bronze die costing $250, but it cost another $900 to maintain the die in operation.

It was necessary to hand polish the die in the press every 2,000 pieces. After each 10,000 piece run, the die had to be taken to the tool room to have .010 to .030 of stock removed from face to clean up. Downtime and maintenance expense was costly.

A Talide die costing $1150 was installed and production now averages over 1,000,000 pieces with no visible wear. It was only necessary to hand polish the carbide die several times during the break-in period while drawing the first 30,000 pieces, with subsequent servicing negligible. More uniform, accurate-to-size parts are produced with scoring eliminated. No subsequent buffing operation on the piece part is required.

During the past 15-year period Revere Copper has installed over 30 Talide dies on their production line—pressing to shape a broad variety of kitchenware items, including sauce pans, covers, double boilers, percolators, handles, etc. Although millions of piece parts have been drawn to date, no Talide die has yet been worn out!

WIRE DIES

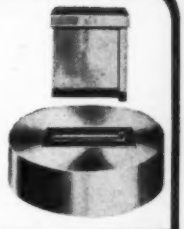
Hundreds of miles of steel and non-ferrous wire—.004 to .750—drawn through TALIDE dies.

COLD EXTRUSION DIES

50 times more valves and tappets cold extruded with solid TALIDE punches and dies.

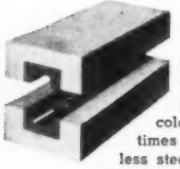
BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE—over hard alloy die.



CURLING ROLLERS

TALIDE curling rolls last 65 times longer than steel rolls on beverage can forming operation.



SWAGING DIES

Leading fountain pen manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

HEADING AND EXTRUSION DIES

Cold heading ¼" C-1008 rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

POWDERED METALLURGY DIES

Compacting highly abrasive chemical powders, TALIDE pill dies last 4 months; steel dies wore out in 6 hours.

A Talide die engineer can help you cut costs and increase production on draw presses, punch presses, pill presses, cold headers, swagers and draw benches.

METAL CARBIDES CORP.
6001 Southern Boulevard
Youngstown 12, Ohio

Send for 68-Page Catalog 59-G

METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 34

HERE'S YOUR RAPID REGISTRATION CARD FOR

THE MACHINE TOOL EXPOSITION–1960

Fill out one of these cards (typewritten) and bring it with you to the registration booth at the Exposition. DO NOT MAIL THE CARD IN ADVANCE. Present the card with your $3.00 registration fee and you will save yourself time. **DO NOT TEAR OFF THE END STUB.** This will be your IDENTIFICATION BADGE AND ADMISSION TO BOTH THE MACHINE TOOL EXPOSITION and PRODUCTION ENGINEERING SHOW.

EXPOSITION HOURS:
10 A.M. to 5:30 P.M.
Daily except Sunday, Sept. 11.

SAVE THIS BADGE. It admits you without further registration fee to the **PRODUCTION ENGINEERING SHOW** on Navy Pier
1 P.M. to 10 P.M.
Daily except Sunday, Sept. 11.
(General public and children not admitted to either exposition.)

Registration Fee $3.00
Payable on arrival at exposition.

The NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION invites you to attend

THE MACHINE TOOL EXPOSITION 1960

MMT-PE

INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.
SEPT. 6-16, 1960

RAPID REGISTRATION. No waiting in line if you type in this card as instructed on reverse side and bring it with you to the exposition. **DO NOT MAIL.**

The first industry-wide exhibit of U. S. A. machine tools since 1955

EXPOSITION HOURS:
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The first industry-wide exhibit of U. S. A. machine tools since 1955

THE MACHINE TOOL EXPOSITION—1960 | THE MACHINE TOOL EXPOSITION—1960

NAME _____
TITLE _____
COMPANY _____
CO. STREET ADDRESS _____
CITY _____ STATE _____

NAME _____
TITLE _____
COMPANY _____
CO. STREET ADDRESS _____
CITY _____ STATE _____

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
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YOUR NAME _____ 5
TITLE _____
COMPANY NAME _____ B
STREET ADDRESS _____ C
CITY _____ ZONE ____ STATE ____ D
MAJOR PRODUCT OF YOUR PLANT
Please be specific
_____
YOUR HOTEL _____

Please check department in which you are employed.
1. ☐ Management 2. ☐ Engineering 3. ☐ Production
4. ☐ Sales or Adv. 5. ☐ Purchasing 6. ☐ Other, please specify

_____

Please check the number of PRODUCTION workers employed at YOUR plant.
1. ☐ Less than 20 2. ☐ 20 - 49 3. ☐ 50 - 99 4. ☐ 100 - 249
5. ☐ 250 - 499 6. ☐ 500 - 999 7. ☐ 1000 - 1999 8. ☐ Over 8000

For additional data, and exposition information write to: National Machine Tool Builders' Association 2139 Wisconsin Ave., Washington 7, D.C.

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Fill in card and stub COMPLETELY. Use TYPEWRITER only.
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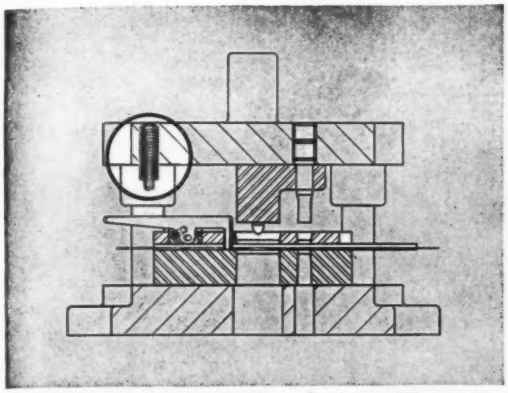
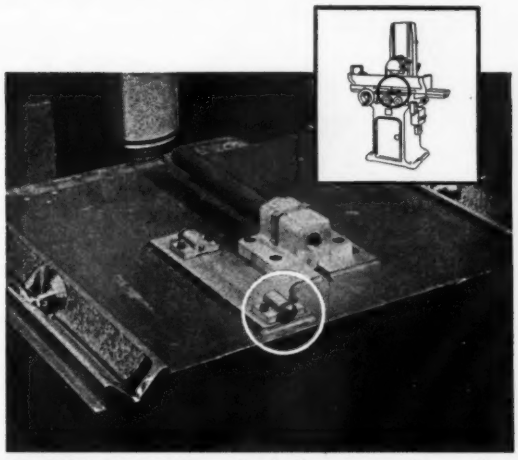
Practical Tooling Tips

Number 2 of a series.

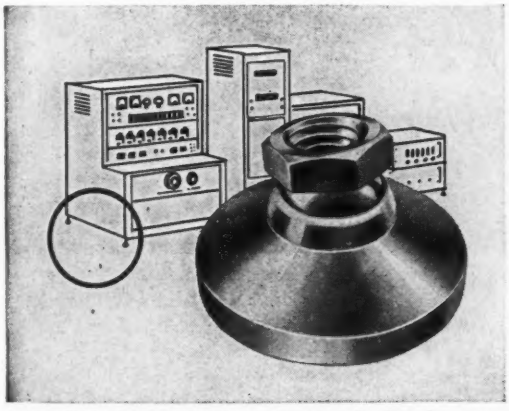
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

TO GET NEW IDEAS on how to save with Vlier Tooling Accessories, send for new 28-page booklet "Typical Applications of Vlier Tooling Accessories." It suggests dozens of ways to use these time-savers in both tooling and original equipment applications. Write for your copy today.

New catalog now ready! Send for your copy today.

Insist on Vlier Tooling Accessories... there's still no substitute for quality!

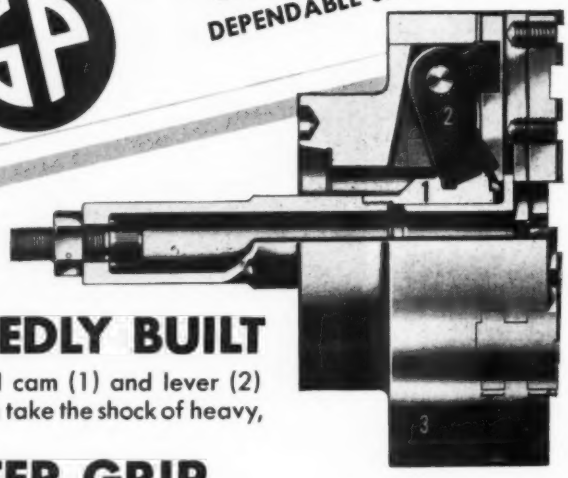
VLIER ENGINEERING CORPORATION

A subsidiary of Barry Controls, Inc.
8900 Santa Monica Blvd. • Los Angeles 46, California

CIRCLE INFORM-A-GRAM KEY NO. 37

Ruggedly Built for INCREASED SPEEDS • HEAVIER FEEDS

SUPER POWER CHUCKS
DEPENDABLE SINCE 1916



RUGGEDLY BUILT
with improved cam (1) and lever (2) action that can take the shock of heavy, tougher jobs.

GREATER GRIP
with longer jaw travel, holds work more rigid, resists opening of jaws by centrifugal force for extra safety.

FLAME-HARDENED WAYS (3)
resist wear, prevent bellmouthing.

S-P SELF-CENTERING CHUCKS

Balanced for high rpm; may also be used for internal gripping; American Standard or serrated; 2 or 3 jaws; sizes 6 to 18".

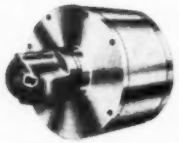
S-P COMPENSATING CHUCKS

Grips out-of-round work with equal pressure on each jaw. American Standard or serrated; 2 or 3 jaws; sizes 8 to 18".

Installed as original equipment by leading manufacturers

SP ROTATING CYLINDERS
Air and Hydraulic

Bore sizes for air: 3" through 16". For hydraulic: 3" through 8" and larger. Speeds up to 3600 R.P.M. American Standard mountings.



AA-9909

PROVEN QUALITY SP CHUCKS • CYLINDERS SPEED • PERFORMANCE

Phone or Write Today for Catalog 112
Representatives in principal cities
FREE Engineering Service

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THE S-P MANUFACTURING CORP.
30201 Aurora Rd. • Solon, Ohio

A BASSETT COMPANY • IN GREATER CLEVELAND • ESTABLISHED 1916

POWER CHUCKS • COLLET and DRILL PRESS CHUCKS • ACCESSORIES
Rotating and Non-Rotating AIR and HYDRAULIC CYLINDERS • VALVES

CIRCLE INFORM-A-GRAM KEY NO. 38

William A. Case has joined the Detroit sales office of Parker-Hannifin Corp., to work under the direction of **Ivan Shuel,** regional manager there.

The appointment of **C. R. Bradlee** as manager of cold forming sales for the E. W. Bliss Co. Press Division was announced recently.

Stuart A. Smith has been named general sales manager of the Tool and Instrument Division, Illinois Tool Works.

Recent appointments at Adamas Carbide Corp. include **Frank W. Hogan,** to the newly created position of marketing manager; **William T. Bradley,** field sales manager; and **Eric J. Werner,** district manager in metropolitan New York-New Jersey.

Elanco Products Co., a recently formed division of Eli Lilly and Co., announced recently the appointment of **Frederic D. Randall** as vice president of industrial and home products marketing.

Raymond L. Donaldson is now Western manager for American Drill Bushing Co. Prior to this he was regional representative for the firm in the Los Angeles area.

James N. Heald II has been appointed to the newly created position of manager of domestic distributor sales for The Heald Machine Co. In his eight years with the firm, he has served in the Heald Detroit sales office and with distributor sales areas in the West and Midwest.

Richard G. Whitlock is now assistant sales manager for the W. W. Sly Manufacturing Co.

Stanley E. Casson, former director of sales of The National Acme Company, was recently elected vice president—sales.

Donald Newell has been promoted to tool and methods engineer for Wales Strippit, Inc., and assigned to cover Chicago and outlying districts south of that city.

CIRCLE INFORM-A-GRAM KEY NO. 39→

NEW INDEXING AUTOMATIC COMBINES MANY OPERATIONS ON LARGE WORK PIECE

This 40-inch Kingsbury machine omits center column, costs less

Center columns are used on most indexing machines for large work or many operations. But for some of these setups we can use this new machine with a 40-inch index table that costs less than machines with center columns.

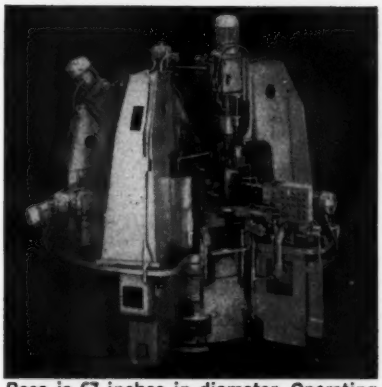
From six to twelve stations are available, but double indexing makes three to five stations possible. The mechanism that indexes and locks the table is similar in design to that used in our center column machines.

The machine shown here operates on aluminum cylinder heads. The work is tipped in each fixture so that the vertical units on columns operate on the two holes A. Behind the left column is a milling unit for the intake manifold face B. The operating unit is mounted horizontally 45° left of the radial center line through the station, and the milling head is 17° off the vertical.

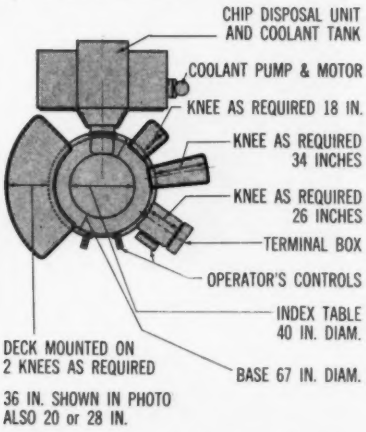
At the back of the machine are two units that work downhill at a 53° angle on hole D. Below them are two units that operate uphill at a 17° angle on two holes C. Finally at the right are two horizontal units for hole E, each mounted 45° left of the radial center line.

We build simple machines, too

Every machine has good basic design and accurate rugged construction. These machines pay off by operating with minimum trouble for years. If you have a job for a multi-unit automatic, we want to talk specifics with you. How about it? Kingsbury Machine Tool Corp., Keene, New Hampshire.



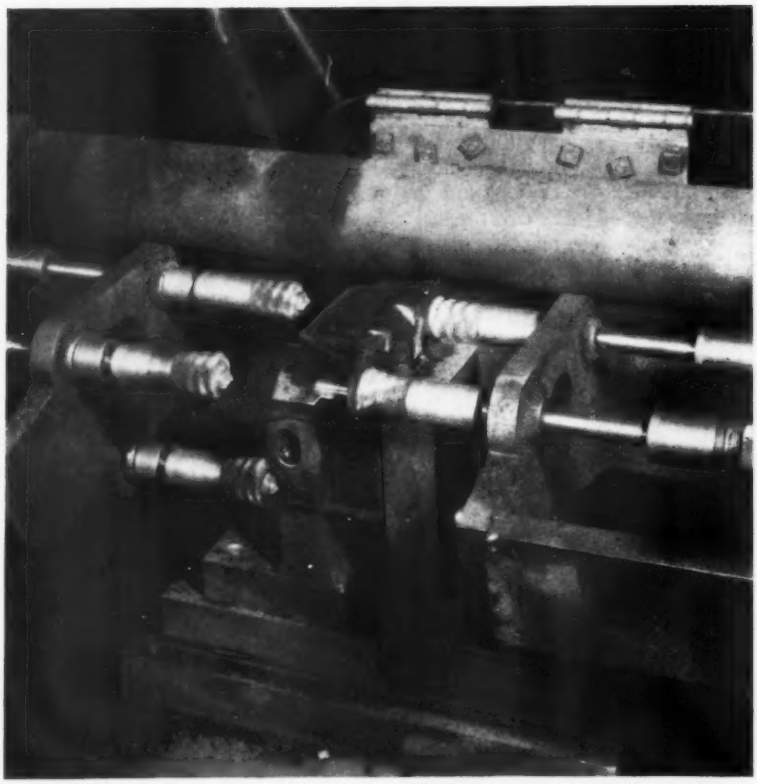
Base is 67 inches in diameter. Operating units are mounted on knees 18, 26 or 34 inches deep as needed, or on decks that in turn are mounted on two knees per deck. Index drive unit is inside base and has a 1 HP 1750 RPM motor.


CHIP DISPOSAL UNIT AND COOLANT TANK
COOLANT PUMP & MOTOR
KNEE AS REQUIRED 18 IN.
KNEE AS REQUIRED 34 INCHES
KNEE AS REQUIRED 26 INCHES
TERMINAL BOX
OPERATOR'S CONTROLS
INDEX TABLE 40 IN. DIAM.
BASE 67 IN. DIAM.
DECK MOUNTED ON 2 KNEES AS REQUIRED
36 IN. SHOWN IN PHOTO ALSO 20 or 28 IN.

ALUMINUM CYLINDER HEAD
STEP DRILL & STEP REAM HOLE D
ROUGH BORE & DRILL 2 HOLES A
DRILL & PIPE TAP HOLE E
MILL FACE B
OTHER HOLES FINISHED ON SECOND MACHINE
DRILL & TAP 2 HOLES C

(Below) Nine units operate from five directions at gross rate of 150 parts per hour. Index table holds five work fixtures with power clamping and unclamping.

FACING... another problem



SPOT FACING operation at Monarch Rubber Company, Hartville, Ohio. These Osborn End Brushes—in combination with drills—are horizontally mounted in two drill clusters. They clean surplus rubber from bolt holes and face the area around bolt holes on both sides of this rubber-bonded-to-steel motor mount. Rate: 750 pieces per hour.

SOLVED with Osborn power brushing

Facing off surplus rubber inside and around the bolt holes of this shock-absorbing, rubber-bonded-to-steel motor mount used to be a production bottleneck for this manufacturer.

Now an efficient combination setup of drills and Osborn Power Brushes replaces a former slow, costly drill press operation. Production is up to 6,000 pieces per 8-hour shift with brush life running 18,000 to 20,000 parts.

Your own troublesome metal finishing problems of every description—deburring, cleaning, polishing, precision blending—can be eliminated with advanced Osborn power brushing methods. An **O**sborn **B**rushing **A**nalysis—made in your plant now at no cost or obligation—is the first step toward smoother, less costly production. Write for details. *The Osborn Manufacturing Company, Dept. L-4, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes
Foundry Production Machinery

CIRCLE INFORM-A-GRAM KEY NO. 40

MEN YOU SHOULD KNOW

Joseph F. Kerigan, general manager of Chrysler's stamping division, has been named to the new position of Group Executive-Stamping in the Automotive Manufacturing Group.

American Emery Wheel Works recently announced the appointment of **Gilbert E. Perkins** as production manager.

Chester C. Holloway has been named president of Gilman Engineering & Mfg. Co., a wholly owned subsidiary of the Parker Pen Co., replacing **William C. Cummings,** who joined the parent company as vice president and manager of the Eversharp Pen Co., a Parker division.

Motor Wheel Corporation, Lansing, announced the appointment of **Robert J. Derleth** as chief engineer.

Edwin R. Smith, Jr., was elected president and treasurer of Seneca Falls Machine Co. upon the recent retirement of **Edwin R. Smith, Sr.** The new president served before as executive vice-president of the firm.

Theodore R. Kennedy is now engineering assistant to the president of Inductotherm Corp.

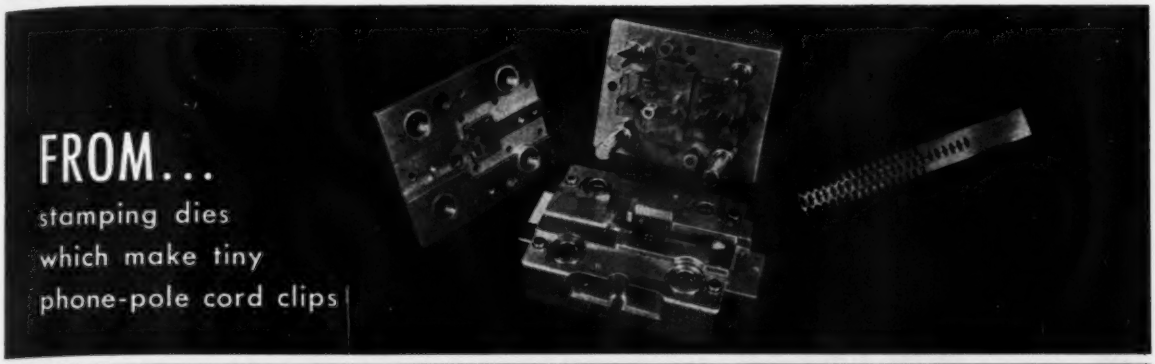
The appointment of **Richard A. Green** to the post of vice president and general manager of the Pioneer Industrial Engineering Division of Pioneer Engineering & Manufacturing Co., Inc., was recently made known. For the past year he was general manager of the Douglas Tool Co., a division of Pioneer.

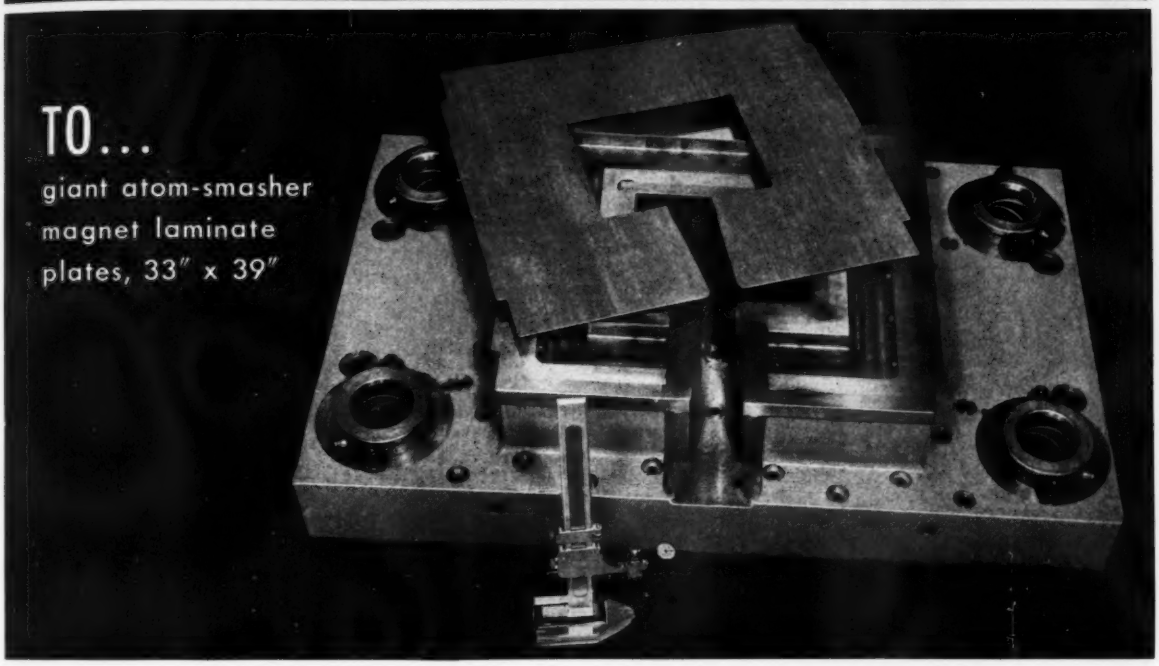
Charles W. Carruthers has been named chief engineer for Electromechanical Components Operations of Raytheon Co.'s Industrial Components Division.

John A. Swint has been appointed Director of Operations for the Ogden Division of The Marquardt Corp., in charge of manufacturing, plant engineering, industrial relations, and security. He was formerly president of Vard, Inc.

. . . **Continued on page 42**

Metallurgical Memo from General Electric





G-E Carboloy® cemented carbides on die cutting edges pay big bonuses

Looking for a better way to cut stamping and die-forming costs? A switch to General Electric Carboloy cemented carbide cutting edges in your dies can work wonders in turning out a better product at lower cost.

Carbide dies in any size, built to the highest standard of quality, will pay big bonuses. Here are just a few: Quality of the part to be stamped or formed maintained with exceptional uniformity throughout the life of the die, within .0005 of an inch. Many more pieces per die. Ability to stamp more nearly burr-free precision parts from brass, stainless steel and other metals with no die pickup. Permits hardening of sheet before stamping. Low scrap ratio. Reduced downtime and maintenance cost.

Any one of these plus-values can substantially outweigh the slightly higher cost of carbides. And, you can be sure of the finest in G-E metallurgically-consistent Carboloy carbides.

Your die maker has interesting facts and figures on both long- and short-run economics through the use of G-E carbides in your dies. Call him or write: *Metallurgical Products Department, General Electric Company, 11111 E. 8 Mile Avenue, Detroit 32, Michigan.*

METALLURGICAL PRODUCTS DEPARTMENT

CARBOLOY CEMENTED CARBIDES

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • VACUUM-MELTED ALLOYS • THERMISTORS • MAGNETIC MATERIALS • THYRITE®

CIRCLE INFORM-A-GRAM KEY NO. 41

Q: VARIABLE SPEED PROBLEMS???

A: SELENIDRIVE* speed controls are your answer!

The AMERICAN RECTIFIER line of standard variable speed drives provides a highly efficient single knob control from any A.C. source for *all* D.C. motors up to 50 HP Incorporating a heavy duty semiconductor rectifier with variable voltage drive, these rugged, reliable units assure smooth starting with infinite *stepless* adjustment from zero speed to above rated RPM with *constant torque*. SELENIDRIVES are designed for continuous duty, have no moving parts or electronic components and are virtually maintenance-free. The basic power package is available with optional automatic preset speed starting, remote control, reversing and dynamic braking. Thousands are in use throughout the world in such wide-speed range applications as printing presses, winding machines, lathes, bottling machines, conveyors, centrifuges and general production line control.

This typical custom-engineered SELENIDRIVE (ill. left), was recently designed as a multiple motor speed control. Six D.C. motors can be operated independently or together for full range control, coupled with a single master speed adjustment, individual and over-all emergency braking stations, all completely combined in a single space-saving console.

At no obligation, our Engineering Department will submit a quotation on any SELENIDRIVE for your speed control problems.

*TRADEMARK

All SELENIDRIVES carry the full AMERICAN RECTIFIER guarantee as to performance and construction. Complete information on their versatile features and time-saving applications may be obtained by writing for free booklet no. T-6.

Other quality industrial products of American Rectifier Corporation include power supplies to 500KW, electric brakes, automatic voltage regulators, etc.

American Rectifier Corporation
pioneers in industrial power supplies
95 Lafayette Street, New York 13, N. Y. WOrth 6-3350

CIRCLE INFORM-A-GRAM KEY NO. 42

. . . Men from page 40

A 17-year Thor veteran and chief electric tool engineer the past two years, **Peter Rebechini** has been named chief engineer of Thor Power Tool Co.'s Aurora Works.

A company-wide program to promote value engineering has been inaugurated by Hughes Aircraft Company, and **Anthony R. Tocco** has been appointed corporate value engineer.

Ben Berk has been named chief engineer of August W. Holmberg & Co., Inc., producers of stampings and automatic assemblies.

Appointment of **Walter R. Opel** as chief engineer has been announced by The Cross Company. He was engineering manager.

John B. Koch has been appointed director of engineering for the Kewanee (Ill.) plant of American-Standard Industrial Division. He's been with the company since 1936.

Appointment of **Donald J. LaBelle** as assistant chief engineer of the GMC Truck & Coach Division was announced recently. He was formerly truck engineer in the Engineering Department, and succeeds **Sheldon G. Little,** director of the newly-created product reliability department for GMC Truck & Coach.

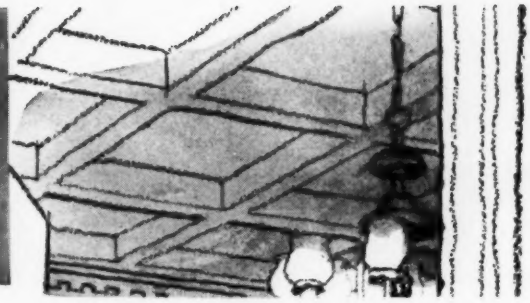
Stanley H. Maikowski has been named general superintendent of manufacturing of the Hartford Division of Emhart Mfg. Co. Before this promotion he served successively as general foreman and plant superintendent at one of the division's plants. At the same company, **Jesse B. Clement** and **Anthony J. Kvadas** were named assistant general superintendent of manufacturing and general foreman, respectively.

Charles B. Eisenhauer has been named general manager of the Electronics Division of Van Norman Industries, Inc.

Clarence J. Cosgro is now general foreman of Arrow Tool Company.

S. Paul Burns, for the past five years vice president and chief engineer of Pioneer Engineering & Manufacturing Co., Inc., has been named Executive vice president and elected a director.

"We were taking the plan for granted"

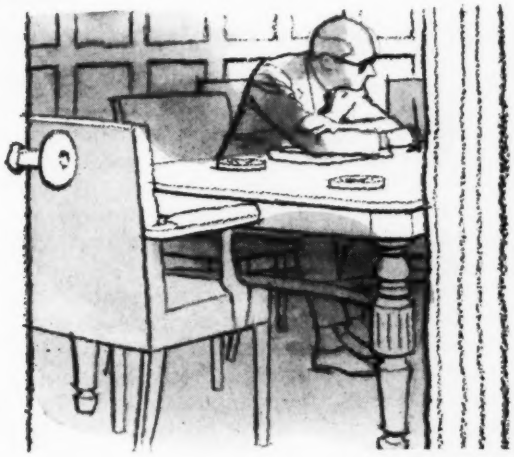


"You know, Ed, it's so easy to take these things for granted. I knew we'd put in the Payroll Savings Plan a long time ago. So I just assumed we had a good, sizable number of our employees who were buying U.S. Savings Bonds regularly.

"Well, last week our chairman asked me for the exact figures. When I checked up I found we had less than a third of our people making regular use of the Plan. We needed to have someone explain—in person—the convenience and soundness of this fine thrift program.

"I contacted our State Savings Bonds Director right away. With his quick, friendly help we set up a thorough canvass of everybody on the staff. We found that many of our company family were just waiting to have someone tell them how simple it is to share in this sound, systematic thrift plan. Then the polite suggestion, 'And why not start now?' really did the work. Today we have a participation we're proud of, and we're taking steps to increase it still more, every payday."

Experience of leading companies shows that spreading Payroll Savings information through the organization, person-to-person, results in quick increases in participation. And that brings such welcome benefits as lower employee turnover, better safety records and the keen satisfaction of helping your people to contribute to our Nations Peace Power.



ALL U.S. SAVINGS BONDS—OLD OR NEW—EARN ½% MORE THAN BEFORE

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ERICKSON

QUICK CHANGE HOLDERS

...for use with your standard MMS tapered tools ...designed for presetting of tools

Now you can use your present standard MMS tapered tools with the *new* Erickson Quick Change Holders. That means you get the double production advantage of Erickson's *high precision coupled with the rapid change feature.*

Several different models comprise the line: Morse taper holders for boring mills and radial drills, milling machine holders that fit standard spindle tapers, turret lathe holders that increase turret lathe tool-holding capacity, straight shank holders with #30 or #40 MMS socket. These holders take Erickson Collet Chuck milling machine adapters in both regular and heavy duty types, end mill adapters, shell and face mill adapters, Morse taper adapters, boring head adapters, and chuck adapters for Jacobs internal taper.

AA-7455

A call or card will bring the Erickson representative on the double. Meantime write for your copy of Catalog G "Erickson Quick Change Holders."

ERICKSON TOOL COMPANY

34551-6 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 44

Quotes From The Forum

AS WE SAID on this page in May, 1954 and June, 1957, the Westinghouse Machine Tool Forum, just concluded, was an outstanding success — having attained a perfection in subject choice, presentation and programming that can come only from repeat performances polished over a 24-yr span.

The following quotes from a few of the many authoritative speakers and panelists will give you an idea of the value, variety and timeliness of the presentations. Some of these subjects we will treat more fully on other 1960 editorial pages.

"Electrohydraulic forming of metals is an exciting new field. It shows promise in the working of difficult metals and in the forming of shapes difficult or impossible to handle by conventional methods. The work being done by many people will determine its place in our manufacturing technology."

L. W. Herchenroeder, Westinghouse

"Despite being in a highly competitive field, machine tool electrical engineers must continue to disclose information gained from tests or from bitter experiences. The complexity and rapid advance of electronics makes it necessary that duplication of effort be avoided. The Westinghouse Forum and the AIEE Machine Tool Conference provide ideal means for interchange of ideas and experiences."

Leonard C. Michelson, Gleason Works

"One of the side-line advantages which sometimes turns out to be of commercial importance is the fact that electrolytic machining can be carried out without producing any burr or layover. In some cases, the freedom from burr saves a considerable amount of cost because the deburring operation costs more than making the part by conventional methods. In other cases, there is no reliable deburring method."

Lynn A. Williams, Anocut Engineering Company

"To use ceramic tools to best advantage, the cutting speeds should be high; the machine tool rigid and relatively free from vibration; and the tool designed for them with appropriate angles and configuration. Machine tool power requirements, as well as speed and feed ranges, can be accurately determined for ceramic tools since, in general, the same rules of action apply as for other tool materials. Ceramic tools often decrease machining time considerably. The most economical use of ceramics requires that machine tools become more automatic in operation in changing tools and in handling of workpieces."

A. O. Schmidt, Kearney & Trecker Corporation

"There are three factors which are important to the revolution in control techniques: First, the broad use of computers, and the expanding use of computer or digital techniques. Second, the development of long-life low-maintenance static equipment such as magnetic amplifiers, static switching, and the solid state devices such as transistors and Trinistors. Third, and most vital, the accelerated growth of the systems engineering concept which puts together a complex array of equipment, the result of which is 'management control' of productive operations."

W. R. Harris, Westinghouse

"Everything has a price tag. No management will approve a plan without knowing what it will cost and whether the return on the investment will be adequate. So plant design must be evaluated and set up to produce the desired return on investment. Several different methods must be considered so that management has the opportunity of assuring itself that the money is being properly spent to produce the desired product at the lowest cost."

Charles E. Pflug, American Motors Corporation

"The quick die change press offers the first real major improvement in stamping plant procedure in the history of the industry. The ability to set dies quickly and as required will have a far reaching influence on planning and scheduling. It will eliminate the need to use costly floor space for storing large banks of panels, as is now necessary, and may be responsible for a complete change in stamping plant design and operation."

W. D. Berry, Danly Machine Specialties, Inc.

"Vibration and sound reduction is necessary for greater industrial precision. Improved surface finishes, control of geometric shape in turning or grinding operations, control of thickness, and accurate tension or pressure controls are all a function of the magnitude and frequency of vibration and/or sound to which the workpiece or machine tool is subjected."

Robert B. Edminston, Westinghouse

The Westinghouse Forums constitute a major annual contribution to the communication of ideas between machine tool builders and users. Editors and their readers, also, are beneficiaries of the Westinghouse effort, and we would be remiss not to give credit where credit is due.

E. Willard Pennington

Editor

Mrs. Florence Smith, operator of the Federal Products Corporation, achieves ultra-precise results with the No. 3 Moore Jig Grinder.

Woman operator at Federal Products maintains 50 millionths accuracy with No. 3 Moore Jig Grinder

Moore Special Tool Company numbers among its long-time customers the Federal Products Corporation of Providence, Rhode Island—a leading manufacturer of dial indicating, air, electric or electronic gages—special equipment used for measuring, inspecting, sorting or automatic gaging.

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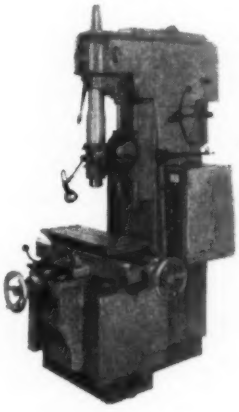

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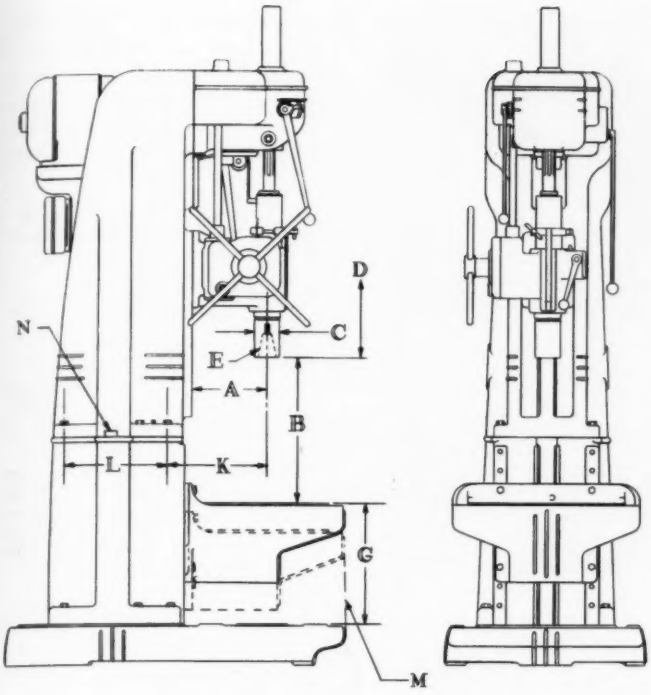
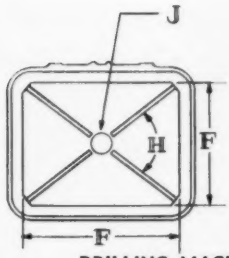




DRILLING MACHINES
UPRIGHT-LARGE, OVER ½" DRILL CAPACITY
Areas Recommended for Standardization

- **A. Distance—Spindle to column**
- **B. Spindle to table—Minimum**
  Maximum
- **C. Spindle—Diameter nose end**
- **D. Spindle travel**
- **E. Spindle taper**
- **F. Table—Working area**
- **G. Table—Vertical adjustment**
- **H. Tee slot—angle—size and type**
- **J. Locating hole—dead center**
- **K. Spindle center line to mounting hole**
- **L. Holes and spacing to be same as production machine tool standards**
- **M. Base to be square with center line of spindle for box table and base to be at least as large as table extended toward front**
- **N. Adjustable type cross keys to be provided for positioning and interchangeability**
- **● Column type**
- **● Feeds—Number and range (Minimum number)**

What Machine Tool Users Told The Builders!

by R. L. Huebner
Publisher

AT ONE SESSION of the 58th Spring Meeting of the National Machine Tool Builders' Association, held last month in New York, representatives of their customers presented a program for standardizing certain dimensions of standard purpose machine tools. This session was moderated by H. Edward Neale, sales manager of The Bullard Company. The customers' proposal was presented by R. L. Witsche, general supervisor, Mechanical Engineering Research of International Harvester, and Colonel H. E. Wiley, U. S. Army, speaking for the Department of Defense.

To at least some of the machine tool builders on hand for this presentation, the program was not new. It had previously been presented to a representative group of machine builders on March 22. It was quite obvious that the users are determined to get substantially what they request, and that a standardization program to achieve this end should be formulated without delay.

The program proposed by the users and the Department of Defense is to set up a nine-man committee, which would include three representatives of machine builders, three of users, and three of the DOD. It was further proposed that the first effort be devoted to the standardization of drilling, grinding, milling, and turning machines. Standardization requested pertains essentially to capacity with respect to workpiece size. (See illustration.)

There was no request made for standardization of machine parts. Neither is there anything in the recommendations pertaining to machine capabilities with respect to power, speed, or accuracy. It is also evident that minimum dimensions may be exceeded while maximums need not necessarily be met.

This program, no doubt, is akin to one which machine tool builders at one time subscribed. It is likely that this effort of machine tool users would not be proposed today if those standards had been followed.

For example, at one time a No. 2 milling machine was intended to have certain agreed upon work size accommodations. Today, a number of builders of milling machines offer the No. 2 size, but this designation is not truly significant as far as dimensional uniformity is concerned.

The implications of the program are far reaching. Simply stated, this standardization means that the user will be able to use, interchangeably, different makes of standard single purpose machines to produce the same part. This capability would benefit all segments of the machine tool using industry, regardless of product, its size or volume. end

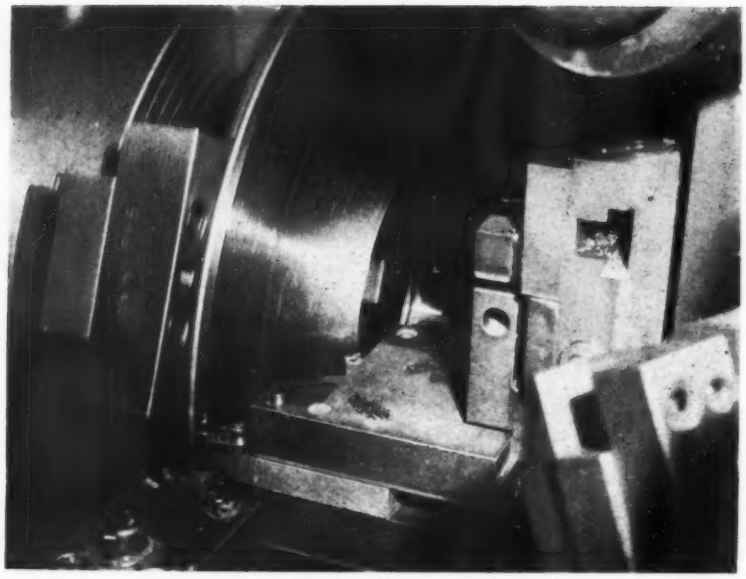


Fig. 1. A pump wheel of C1144 is being faced, with stock removal at 1780 sfpm.

Operating Data

Material	C1144
Stock Removal	0.130"
SFPM	1780 (at large dia) 885 (at small dia)
RPM	354
Feed	0.004"
Tool Signature	Five, five neg. triangular, 3/8" IC, 3/16" precision ground VR-97, st'd steel shank index holder.

What You Can Do With Ceramics

. . . based on the author's cutting tool research projects while at the Metal Removal Center of the Spring Garden Institute.

by Horace Frommelt

Mr. Frommelt is Director of the Manufacturing Research Center at Ferro Powdered Metals, Inc., Louisville, Ky.

CERAMIC TOOLS are so priced and constructed that a relatively high metal removal rate must be selected if you are to take advantage of their superior ability. This means attaining maximum production at a minimum cost — a concept no one can justly hassle over. These recent case histories will lift the fog for those who want to machine with oxides.

In Figure 1, a pump wheel is being turned from C1144. Where applicable the use of C1144 offers a sensible start for those unfamiliar with the use of these more fragile cutting elements. This is a facing operation using a VR-97 triangular throwaway insert in a standard holder.

Significantly, the stock removal is slightly phenomenal at 1780 sfpm. This is the removal rate at the OD, which is 19". The ID is 10", which means a surface rate decrease from 1780 to 885, which is considerable, and cutting pressures increase to endanger the cutting edge. With ceramics, however, damage from this change is less likely.

Other interesting specs show a feed rate of 0.004" taking a cut 0.130" deep. This is a three-fold increase over carbide, with the added advantage of good finish. In this instance a 30 micro-inch finish was achieved. If better finish were needed, it could possibly be achieved down to 10 micro-inches — by changing the nose radius from 1/32 to 3/32". Tool life is 10 min/edge, which might have been increased by experimenting.

Another interesting example of ceramic machining is shown in Figure 2. Here the hub-facer is about to engage the work while a 2.47"R is being machined. Material being turned is the same carbon steel as above, with 44 points lead for good machinability. The stock removal is 0.015" and the sfpm rate at the large OD is 1800, turning at 466 rpm.

The feed rate is 0.004" on the face and approximately 0.0065" on the 2.47"R. Although the radius tool is hidden, both the facing tool and turning tool are cutting.

These two examples accounted for an increase in production of 33%, and a decrease in floor-to-floor time of 35%. Even though tool costs were 50% higher, these advantages made the use of ceramics economically worthwhile.

Another shot of the part is shown in Fig. 3, which was taken after the radius tool had completed its cut. Comparing it with Figure 2, note the exceptional 30 micro-inch finish in Figure 3 — well above the specification. This is a familiar characteristic of machining with ceramics. Frequently finishes are better than a grind, which would take considerably more time. Or, rough grinds can often be eliminated this way with a final grind for finish.

The pressure plate shown in Figure 4 is a typical facing job being performed regularly at a decided savings. Material is 40 Rc cast iron whose stock removal is approximately 0.028" at a feed rate of 0.007". Here again the amazing thing is that this operation is done at 1100 sfpm at the large OD. It's true this is reduced to approximately 750 at the ID, yet both rates are four times higher than what would be specified for carbide.

Generally, a cast iron such as this would call for a sfpm rate of 250 to 350 with carbide. Expected tool life would be low. In fact, it is likely that carbide would not even do the job satisfactorily. Carbide edges would have a tendency to chip and the cast iron structure would cause lands to wear prematurely.

Results show a superior finish, and a 45% lower piece price. Again, tool costs were higher, but the all around excellent performance was well worth it.

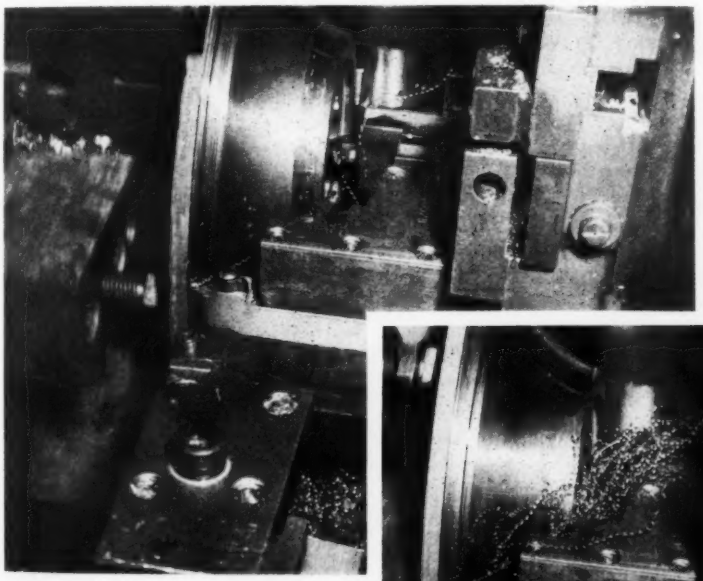
In none of these cases were special machines or special tooling used. However, if even better results are desired, a copper impregnated powdered iron tool shank would be in order. A powdered metal shank can be expected to dampen cutting vibrations and allow even higher sfpm rates with the same tool life. This would, of course, increase the removal rate.

Important Considerations

The use of the proper chipbreaker is also essential to good results with ceramics. With chips curling and turning over into the work the cutting edge can be damaged undeservedly. This has been one of sintered oxides' most difficult education areas.

For best tool life, the use of proper coolant is important. Water soluble oils are replacing the straight and heavy oils, and the traditional soluble oils (20 of water to 1 of oil) are being replaced by synthetic mixtures that are proving most effective. The entire phenomena of coolant action and interaction is a no-man's-land at the moment. Too long deferred and much needed attention is now being given this important adjunct to good machining.

It is not merely a matter of extracting heat, but the formation



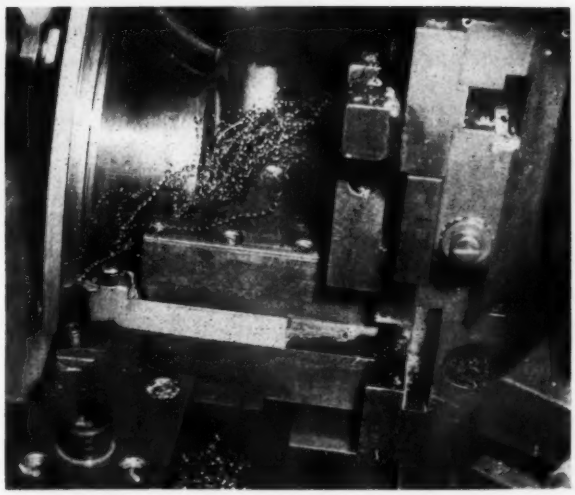
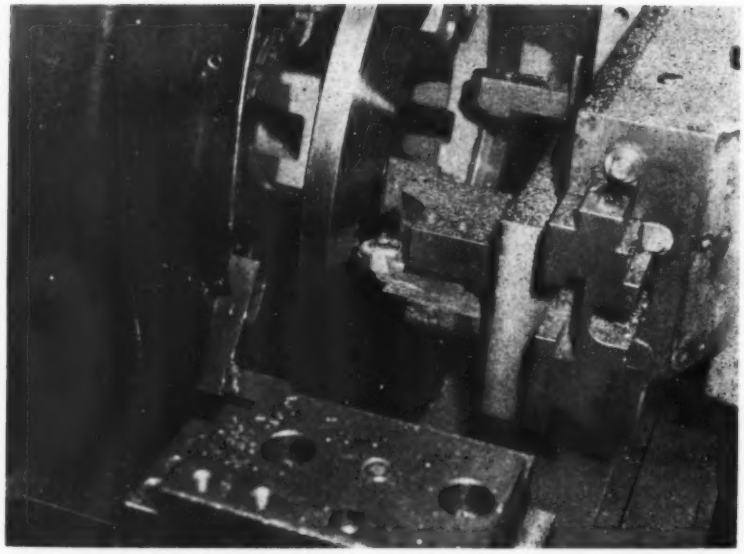


Fig. 2 & Fig. 3. A similar turning operation with ceramics at an impressive 1880 sfpm. Note the surface luster after the finish turning of the 2.47"R. An expensive grinding operation was eliminated since a 30 micro-inch finish was achieved with the ceramic tool.

Operating Data

Material	C1144
Stock Removal	0.015"
SFPM	1880 (for ten min tool life—large dia)
RPM	466
Feed	0.004" on face 0.0065" on radius
Tool Signature	Five, five neg. triangular, 3/8" IC, 3/16" precision ground VR-97, st'd steel shank index holder.



Operating Data

Material	Cast Iron Rc 40
Stock Removal	0.028"
SFPM	1100 (at large dia) 750 (at small dia)
Feed	0.007"
Tool Signature	Five, five neg. triangular, 3/8" IC, 3/16" precision ground VR-97, st'd steel shank index holder.

Fig. 4. Here a pressure plate is machined at a decided savings. The 40 Rc metal is given a superior finish at removal rates four times higher than what would be specified for other cutting tools.

of organ-metallic chemical compounds that act and react on the chip, the workpiece, and perhaps even the tool.

The flood or gravity technique is taboo; an aerosol mist must be applied at pressures from 60 to 100 lbs and direction and location are most important. Unless the coolant comes in contact with the cutting element at the interface of the ceramic and the workpiece, benefit will not only be nil but, likely, decidedly negative.

The point of mist application is so important and critical it cannot be over-emphasized. Tools are now being designed to carry coolant to the tool edge through an opening in the shank. From here it is deflected by baffle plates at the front of the holder.

It is no longer possible to leave the positioning of the coolant to the operator. It must be arranged so that this important ceramic running-mate is brought to the exact "pin-point" cutting spot, permanently. If production superintendents will patiently embrace this detail their companies will be rewarded.

Another suggestion for the better operation of these oxides is to pay attention to *tiny* breaks in the cutting edge. Microscopic though they may be, they spell trouble. A break will act as the beginning of a fracture and early edge breakdown can be expected.

Some companies, with a good ceramic use record, test their cutting tool edges. To do so, they present the edge to a surface plate coated with a thin film of a graphite-paraffin mixture which enters minute cavities. Attention is drawn to the defect in this way, and any tip shown to be porous is not used in production.

It has also been found that a small chamfer in the order of 0.010", carefully honed on the cutting edge, gives increased life. However, the practice of honing the flank and top faces to reduce cratering doesn't always do the job. The theory that decreased resistance to the flow of the chip will increase edge life isn't completely true. In the first place, ceramics come to the user with an average micro-inch finish of 6. This corresponds to something like a 20 average for carbide. It seems love's labor lost to diamond hone or lap the material.

This is not true of the cutting edge itself though. If it is carefully honed or radiused (about 0.010") the tiny breaks that could end up as massive failures will be eliminated — tool life will be better.

It no longer requires unusual bravery to start using ceramics. With careful consideration of these axioms and a little experience, success is imminent.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

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Press Toolde for Progressive Broaching

by Arthur W. Wille

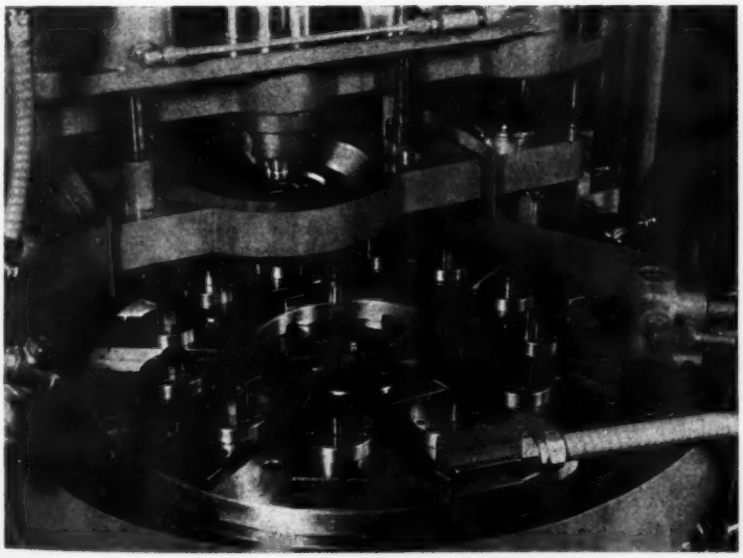
Fig. 1. Electrical connector shells require five internal keyways, broached on a specially tooled press.

INTERNAL KEYWAYS are broached in electrical connector shells by the Amphenol-Borg Corp., Chicago, on a specially tooled Denison 4-ton, 2-strain rod Multipress. Each connector shell contains five internal keyways 0.038″ deep, 1/4″ long, and meeting a 1/8″ wide relief undercut. One keyway is 0.155″ wide; the remaining four, 0.094″ wide.

Thru-broaching, using a multiple-tooth broach, was not possible because of a shoulder on the inside diameter of the shells. So, special single-tooth progressive broaches were designed to remove 0.0035″ of material per tooth during the first 10 steps. The last two broaches remove only 0.001″, to finish the operation.

Broaches are mounted on a hardened tooling plate with jig-ground dowel pin locating holes and jig-ground registration holes for positive alignment between each broach and a part locator. Tooling plates are mounted to a circular base which is, in turn, mounted on a standard 12-station Denison index table.

Fig. 2. As the ram descends, the connector shell in place on the part locator is clamped between the upper and lower moving platens and then forced over the broach.



The part locator consists of a male pilot with a detent spring and a slot for radial positioning. This is mounted to an intermediate tooling platen, which is accurately guided by the two strain rods of the press. The hardened and ground rods are secured to the press bed and the upper (stationary) platen. Parallelism and squareness of rods with respect to the press bed, upper platen, and each other are maintained to a maximum tolerance of 0.0005″.

Another intermediate moving platen, beneath the upper tooling platen and connected to it with two single-acting air cylinders, applies clamping force to hold the parts

Mr. Wille is president of the Wille Tool Corp., Chicago, the firm which built the special tooling described in this article.

firmly during the broaching operations. This platen, containing registration pins, is also guided to ensure proper alignment. Upward motion of this lower moving platen is restricted by two rods. At the end of the broaching cycle at Sta. #12, the press ram retracts fully and the stop rods vent the air cylinders and release the part for unloading.

Press ram stroke length, which is adjustable, is set to operate at 0.5". Motion is confined to just that required for clearance and proper functioning of the tooling and index table.

Part locators and broaches were designed to be readily interchangeable. All screw locations and dowel locations were jig-bored to provide maximum accuracy. A skip-station device was added to the index table to accommodate parts with shallow slots that do not require as many progressive broaches. Cams can be added at stations where no broaching is to be done, causing the table to bypass these stations without activating the press ram.

Broaching the five internal keyways in a connector shell begins with the operator loading a part on the locator at the upper moving platen and depressing dual safety pushbuttons. The main press ram descends, clamping the shell between the upper and lower moving platens. Continuing this downward motion, the ram pushes the lower platen, with its registration pins, into the base tooling plate and forces the shell over the broach to the bottom of the ram stroke.

As the ram retracts, the shell is stripped from the broach. With the ram in retracted position, the index table moves the part to the next station and the ram descends automatically for another broaching operation. The cycle is repeated until the twelfth station is reached. A special control at Sta. 12 causes the ram to retract fully—unclamping the finished part, and permitting the operator to unload and reload for the next cycle.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

Myron Curtis, (right) vice president of engineering and inventive force behind the W&S automatic chucker line, explains a point about the new O-AC to N. B. Clark, sales manager of the Machine Tool Division.

From the Cover:

New O-AC 'Miniaturized' Automatic Chucking Machine

A NEW "MINIATURIZED" single spindle chucking automatic, the O-AC, is being introduced by The Warner & Swasey Company. It is the fourth, and smallest, in the company's line of versatile automatic chucking machines.

Designed to bring the advantages of automatic production to small lot producers of precision components, such as computer and guidance system hardware, the O-AC is capable of holding exceptionally close tolerances and producing fine finishes. It sets up and can be changed over from job to job quickly and easily, and has the flexibility to handle a wide range of work with relatively simple, low-cost tooling.

Nominal working range of the O-AC is approximately a 3" dia x 3" long. Air chucking is used, featuring a 6" dia chuck and 4½" dia tandem air cylinder. Spindle speed selection over a 87-2507 rpm range, plus front and rear cross-slide and turret feed selection, are automatic.

A total of 16 spindle speeds — in four ranges of four speeds each — are provided. The particular range desired is selected during setup by means of simple change gears. During operation, speeds may be changed automatically for each tooling station or during the cutting stroke of any one tooling station.

Three automatically selected feeds are available for use on any one job from an 18 feed, 0.001 to 0.083 range. The turret and cross-slides feed at the same rate. Feeds may be changed automatically to satisfy the needs of each tooling station or during the stroke of any one station. Right- and left-hand threading gears—from 11½ to 48 threads/in.—are available for solid or releasing type taps or die heads. The O-AC also is equipped with automatic reverse for left-hand threading and for backing out solid threading tools.

One or both cross-slides may be selected to operate with any or all pentagon turret stations. Multiple tooled turret stations combined with the machine's unusual tool slide actions and spindle functions —late cross-slide, spindle reverse, turret feed, and late cross slide— keep tooling costs low on the widest possible variety of work. Standard tools will handle most jobs. end

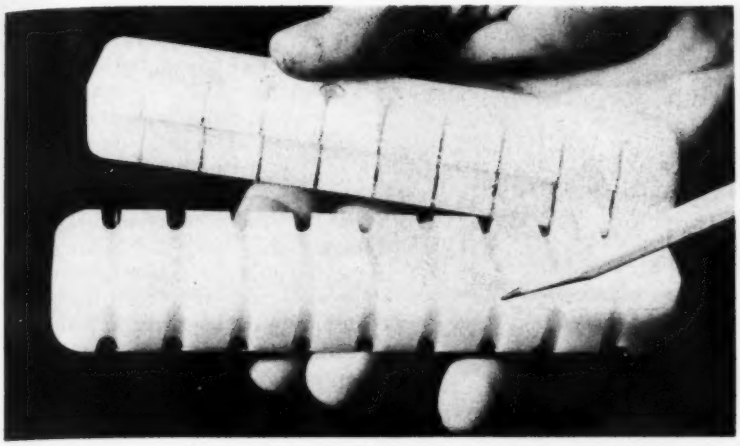


Fig. 1. Mandrels used in bending heavy-wall aluminum extrusions are machined from solid nylon rod or bar stock.

Nylon for Tooling

by N. A. Flemming

Mr. Flemming is plant manager at The Polymer Corporation, Reading, Pa.

THE IDEA OF USING NYLON for tooling may come as something of a surprise to many. But, in surveying the uses of parts made from nylon stock, we have found hundreds of tooling applications. An analysis of these applications shows that the use of nylon can reduce tooling and production costs in three major ways: 1) Increase the life of production tooling, 2) reduce production scrap caused by tooling, and 3) save toolroom time.

Metal Forming

Tool parts cut from extruded nylon rod, plate, and tubular bars have proven valuable in roll forming, stamping, and bending and forming non-ferrous strip, extrusions, and tubing. Even stainless steel strip is being formed by nylon forming shoes and wiping blocks in both hand and power equipment.

In one stamping application, a nylon die made from 1/4" nylon 101 slab is mounted into a metal blank for maximum rigidity. Using a press stroke of 2" and a pressure of 20,000 psi, 1800 parts/hr are stamped from 20-ga prefinished brass strip. The strip has a Rockwell T hardness of 40-50 and impact on the nylon is approximately 5,000 ft-lb/sec.

Part Holding

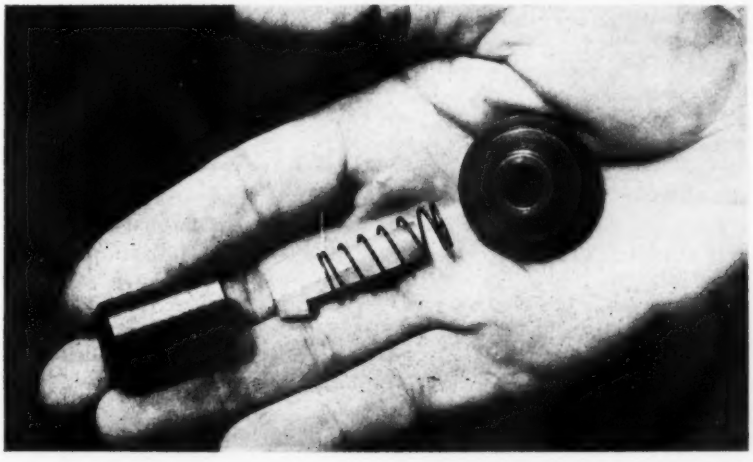
A midwestern tool designer used nylon for collets and arbors to hold precision steel rings during grinding, honing, and polishing operations. All rejects due to scratching the rings on the fixtures were eliminated. In addition, nylon tooling lasted as much as 10 times longer than steel. An added bonus was gained by re-sizing the nylon fixtures after they showed signs of wear.

Considerable damage can be done to parts during assembly or transfer between operations. An engine manufacturer, for example, had a high reject rate on finish-ground crankshafts, due to nicks and scratches. The scratches were traced to the padded V-blocks used to hold the finished shafts on the conveyor line. Instead of carefully placing the crankshafts on the V-blocks, workers were dropping them into the holder. The impacts soon wore the padding and exposed the metal base, thereby producing the nicks. The tool engineer recommended nylon facing pads for the V-blocks and stopped the scoring.

Feeding, Sequencing, Timing

The properties of nylon that are useful for holding and forming are also important to part feeding, sequencing, and timing. Certainly, if

Fig. 2. Collet machined from Polypenco nylon stock eliminated scratching and reduced scrap from 8% to less than 1%.



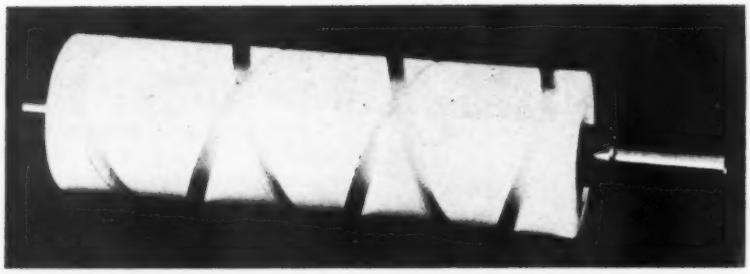


Fig. 3. Lightweight nylon traverse cam comes up to speed faster, requires less driving power, and is quiet in operation.

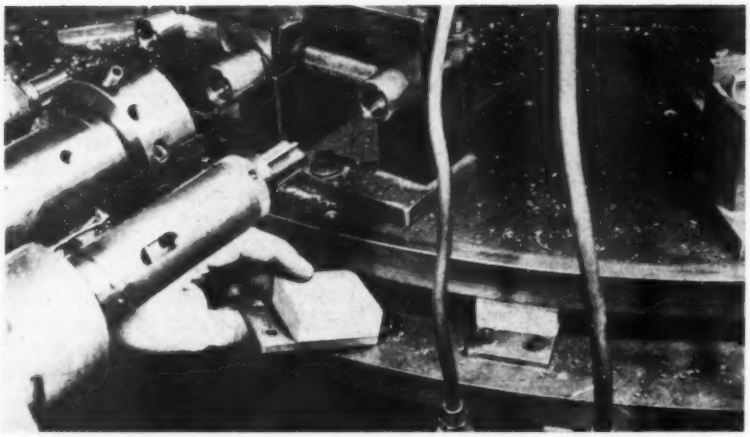


Fig. 4. Nylon blocks cut from stock shapes support the indexing table of this machine. Wear on the blocks has been negligible in over two years of service.

nylon can reduce scrap during processing, it should do the same for pickup and transfer operations.

Bronze plates on a feed slide assembly of a multi-spindle automatic screw machine wore rapidly. It was necessary to replace them every two to three weeks to maintain accuracy in the feed. The tool engineer replaced the bronze with 5/8" nylon plate. The nylon part has been in use for over three years with only slight wear. In addition to the substantial savings in material, labor and downtime for replacement, the toolroom time previously required to make a new bronze part every two weeks is also saved.

An interesting nylon cam design is shown in Figure 3. These traverse cams are powered by a friction drive and operate on an intermittent cycle from 0 to 3500 rpm. The nylon cams require less driving power, come up to speed faster, and have resulted in a 20% to 30% increase in production.

No production tool is better than the tolerances it holds in the finished part and it is practically impossible to hold good tolerances with a tool that wears rapidly. The indexing table shown in Figure 4 had a tendency to "give" under vertical tooling pressure, thereby causing out-of-tolerance parts. Four 3/4" thick nylon blocks were installed between the indexing table and the machine bed. In over two years of service, the wear on the nylon blocks is negligible, even in the presence of water-based cutting oil and abrasive chips.

Saving Toolroom Time

Tool engineers report few problems in machining parts from nylon. Standard metalworking equipment is used and all machining operations are faster for nylon than tool steel. Some operations required for tool steel are eliminated entirely. For best results, cutting tools must be kept sharp and should have sufficient clearance so that only the cutting edge contacts the material. Any rubbing action is detrimental to the finish and tolerances.

Smooth surfaces are easily achieved on both heavy and light cuts, so roughing cuts are rarely required. With coolants, preferably of the soluble-oil type, surface finishes of 15 micro-inches are readily obtainable. In general, very high speeds with relatively light feeds produce the best results. Nylon 101, for example, is turned at 900 to 1000 sfpm. All nylon is rather flexible, and provision must be made to prevent flexing of the stock away from the cutting tool. Vibration and chatter must be avoided.

Drilling should be done with a low helix drill with polished flutes. The best speed for drilling will vary with the job, but a good starting place is 2100 to 3000 rpm with a 1/8" drill.

Milling of nylon is easily accomplished on standard milling equipment. Conventional cutters can be used, with surface speeds in excess of 1000 fpm. Climb milling should be used to keep burring to a minimum. Heavy feeds of 9 ipm are satisfactory, but care must be taken to minimize heat generation. A good supply of coolant should be used. For best surface finish, lighter feeds are recommended.

Surface grinding is seldom required since standard operations can produce a 15-micro-inch surface. Centerless grinding of nylon rod is performed on standard nonmetallic bar grinding fixtures with the work center 1/8" below the centerlines of the wheels. Guide tubes should be used on both entrance and exit to minimize whip. A soft grade wheel with open grain is satisfactory. Coolants must be used for successful grinding.

Eliminate Operations

Surface grinding is not the only operation that can be eliminated by making tool parts from nylon stock shapes. Obviously, no heat treating is involved. Even more important are the elimination of rework and adjusting frequently necessary with a water-hardened tool steel, and the chance of cracking or warping as may happen during heat treatment. end

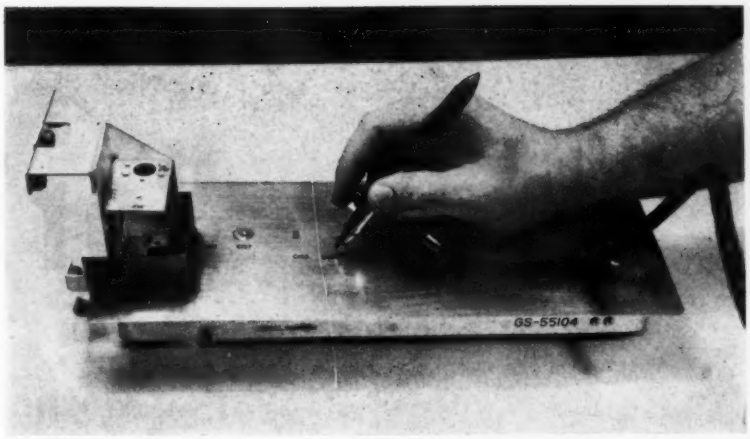


Fig. 1. Airbrush is one method of marking with precision stencil; any spray type equipment can be used with proper lacquer ink.

Contoured Stencils—Speed Part Marking

PRODUCTION MARKING of electronic chassis components and similar equipment must be speedy, and precise, to avoid assembly bottlenecks. Many companies have solved their marking problems by using engraved brass spray stencils made to fit the contours of the workpiece.

In the Precision Stencil marking method, the brass stencil is accurately positioned on the part and sprayed with non-smudging lacquer. The lacquer can be applied with either an air brush (Fig. 1) or a spray gun. Additional coating with clear lacquer is not necessary since the stenciled markings do not smudge or rub out during assembly. Accuracy and speed of marking is increased because the stencils are custom made to fit the contours of any size or shape part. Positioning indicators which match holes, posts, or indentations of the part are fabricated into the stencil.

Working from a sample part or dimensioned drawings, Jas. H. Matthews & Co. makes the stencils to extremely close tolerances. The stencils most widely used for chassis marking are the flat, pan, and individual symbol types. A complete chassis can be marked with the flat stencil and, with adaptation, the same one can be used for both sides of the part. Recessed components in hard-to-reach locations can be marked with a pan stencil, which fits tightly onto the part (Fig. 2). For marking symbols and codes, small stencils can be used individually or in combination with larger spray-gun setups.

Marking of a large number of parts with the same stencil is no problem since each stencil is permanently engraved in brass. When modifications are necessary new inscriptions can be re-engraved or obsolete markings can be covered. Interchangeable panels on some stencils hold engraved inserts for quick, easy changing of data from one part to the next. end

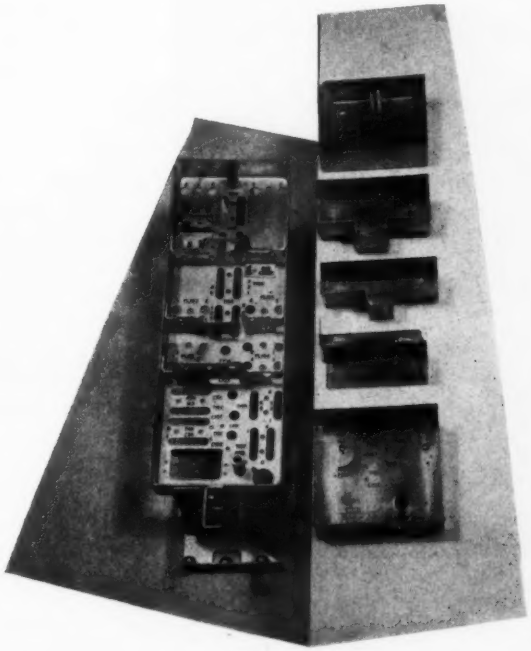
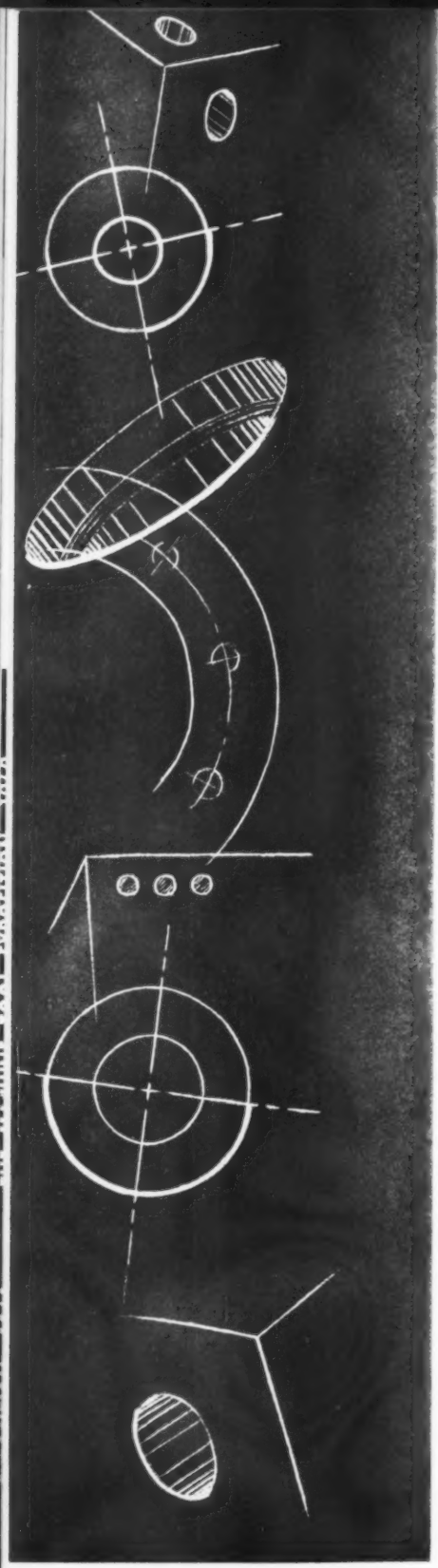


Fig. 2. Complex chassis (left), and the pan type spray stencils used to mark them (right). Top and bottom stencils have locating tabs for accuracy, others fit snugly without tabs.



Special Engineering Report:

Boring

. . . methods, machines, and

by William E. Hoffman
Engineering Editor

Where drilling is usually machining solid metal, boring is, for the most part, enlarging existing holes that have been drilled, bored, punched, cored, etc. It is not enough to start a hole in the right location; it must check out after boring. And, its center must be located correctly for its full depth. Here are some ways of doing it.

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miscellany . . . for making close-tolerance holes

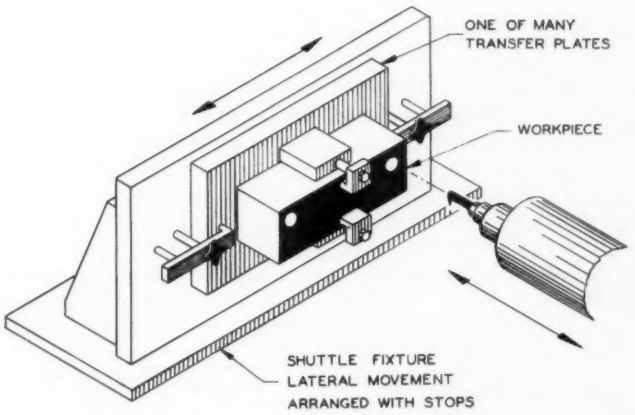
THERE ARE TWO BASIC approaches to boring: In one the work revolves about a non-rotating cutting tool; in the other, the tool turns as it bores into the non-rotating work.

Rotating the work is most often applied to small parts, since the procedure is likely to be limited by part size or equipment available to rotate it. Normally, large work is more easily handled on a vertical lathe, although when proper equipment for handling is available, large horizontal lathes can successfully be used.

The other approach, where the cutter turns, usually calls for the use of a boring machine, jig borer, or a special machine built up from Building Block components.

There are four basic methods of establishing a hole location. The first, offering the least accuracy, is the scribed-line technique. Even though height gages and lapped scribers are used to establish centerlines, this center can be prick-punched to within only 0.0005" tir — at that, extreme care must be used, and it would be hazardous to count on its regularly. Then too, this is just location; it's something else to end up with a finished hole whose center is this close.

Next in line for closer location is "buttoning," where a toolmaker uses a cylindrical button to estab-



Where repetitive low production runs are required of a variety of size-similar parts, the transfer plate system is an economical approach. Here a shuttle fixture is adapted to a horizontal boring machine built up from a standard base and a standard boring spindle. The transfer plate is equipped with standard locating pins and clamps whose locations are peculiar to the particular workpiece. Transfer plates will all be alike in respect to mating with the machine fixture. The plates are easier to store than complete fixtures and represent substantially less fixture expense per part.

An even simpler approach would be the use of standard angle plates set up with appropriate stops for location. These could be set up by skilled personnel for production runs by semi-skilled operators.

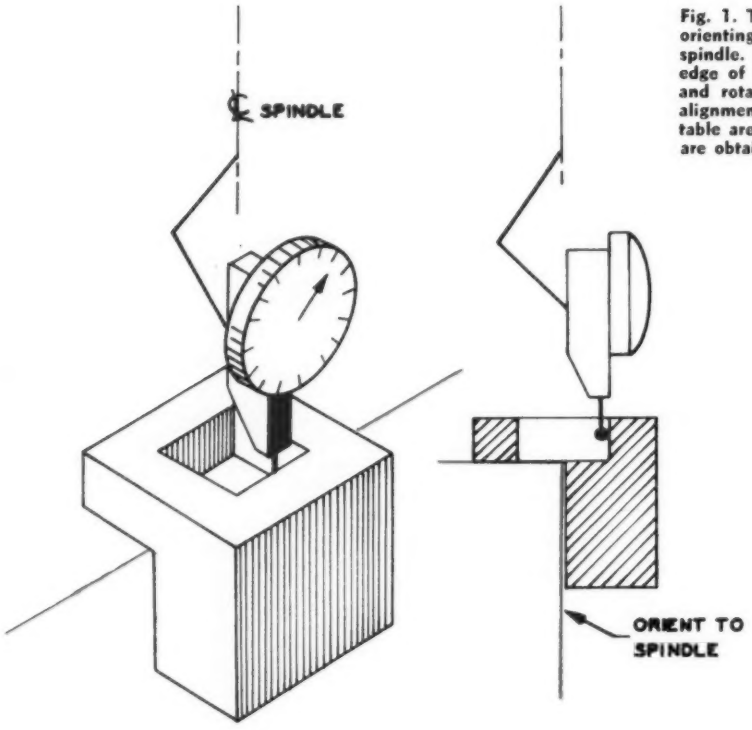


Fig. 1. The edge finder is used for orienting a workpiece to a machine spindle. By holding it against an edge of the clamped-in workpiece and rotating indicator on spindle, alignment is established. Spindle or table are moved until like readings are obtained for both sides of slot.

lish final hole location to tenths. In this case the button is secured by a hole whose location is approximate. The button is indicated and tapped into "exact" position. Now that the location is established the button can be "picked up" to bring the machine spindle into position for final boring.

The third method is "transferring," which is using a master whose proper hole locations already exist. These locations are transferred from master to workpiece by superimposing. This method results in accuracies like those achieved with buttoning.

Fourth, and the most accurate, is "direct locating" — boring with a machine manufactured so that extremely accurate locating and machining can be accomplished. It is mandatory that a machine of this class have a spindle-table relationship that's adjustable and accurate to a tenth.

Although boring operations vary as to required accuracy, clamping the part to the machine table should be adequate to prevent movement during machining. Clamping should not, however, defeat the purpose of the operation by moving the work out of position or distorting it.

Accuracy increases as bar and tool deflection are minimized, and consideration should be given to mass distribution when designing for boring. Designing should be done with an understanding of the forces the bored hole will encounter, both in use and during machining. This is fairly easy when a part is to be used in a static position; if it's to be a moving part, other considerations are required.

Since hole-location is usually from some "base-surface," an easy method of surface pickup, after workpiece is machine-mounted, is needed to establish an *initial* table-spindle relationship. Indicators have been the answer for years and can be bought in sets that include holders, line finders, and edge finders. The easiest to use is the edge finder which is held firmly against the edge of the workpiece and an indicator is rotated on the spindle to pick up the slot. The table is moved laterally until the same reading is obtained on either side of the slot (Fig. 1).

Another method of finding an edge is to position a spindle-mounted indicator tip reasonably close to the spindle center and touch the edge to be established. The spindle is then raised and rotated 180° to "indicate" a gage block held against the same edge. Through spindle or table adjustment and repeating the process a zero (or like) reading is reached. This method is less convenient but almost as accurate as the one previously described.

When less precision is necessary, a scribed line or a point may be picked up by a "wiggler" or a "line finder." The wiggler is chucked in the spindle and rotated until made to run true by finger pressure. When running true, the spindle is lowered close to the mark on the work and the spindle or table moved till coincidence is reached. A magnifying glass is a big help here.

Boring accuracy is always improved by taking one or more roughing cuts before finish, to minimize tool deflection. Where possible, it is recommended that all rough boring operations on any given workpiece be completed before starting finish boring.

As is the case with many machining operations, consideration should be given to thermal expansion and how it might affect size and location of a hole. For optimum results, the workpiece should be held to the same temperature during boring as its temperature is to be when location demands are made of its holes. If no particular working temperature is specified, its holes should be bored at 68°F (standard ambient temperature) since it will probably be gaged at this temperature. Although temperature may be altered somewhat during machining, it is usually sufficient to control the temperature of the room in which boring takes place. Where extreme precision is

involved other precautions may be considered, such as special cooling of the tool, machine, and/or work.

Time lapse boring to prevent stress concentration and insure accuracy of final bores is often indicated on fussy work. Here a time element is employed to allow metal movements, caused by machining stresses, to equalize themselves between rough and final cut. Good practice comes through experience. It is almost impossible to set forth reference data for this due to the varying conditions.

In making any setting of either the spindle or the table the approach to final position should be made without turning back. If you "overshoot" your approach, another should be made after backing away. This practice is a must on machines equipped with lead screws even though anti-backlash provisions may be built-in.

There is probably as much work ruined by improper chucking procedures as there is by improper use of feeds, speeds, and tools. A little care and understanding should be employed.

After chucking a workpiece requiring only moderate tolerances and finish, it may be turned slowly and checked for concentricity with a piece of chalk. On the other hand, if greater accuracy is required, Prussian Blue or Red Lead can be lightly painted on the OD, or the ID, and a soft pointer used to check concentricity and runout. For an even closer check, an indicator may be employed.

MACHINES

A boring machine may be "accurate" when new and every effort should be made to maintain near original accuracy as long as possible. The usual cause for accuracy deterioration is wear that comes from an abrading of working surfaces. In an effort to minimize this and increase a machine's optimum life, several things should be taken into consideration: 1) Were materials used best suited to offer resistance to wear under expected working conditions? 2) Were they designed to have proper contact area to support expected loads (surface finish enters the picture, too)? 3) Were provisions made for proper lubrication? 4) Will foreign matter be efficiently excluded?

A good practice to distribute wear on a machine table top is to set work up on the corners as well as on its center area. If machine-use activities usually monopolize the center of a worktable, "rush" or emergency work can't be accommodated without dismantling work already on the table.

The number of holes to be bored, the material to be machined, tolerance specifications, finish expectations, and other considerations dictate machine choice. The decision may be easy or complex. If there's only one hole to be bored, a single spindle machine may do, even if a rough and finish are required. Various bars may be used as well as block or cartridge type tooling. On the other hand, a two-spindle machine may be the answer where the roughing and finishing of two pieces can be done at the same time. After rough boring, the part will be positioned under the finish bore spindle, and another workpiece loaded under the rough bore spindle. The production demand governs the procedure.

Physically, a boring machine is built around two basic elements, its spindle and its work table. All other machine elements are contributory and their applications vary greatly with the work expectation and the manufacturer.

A boring mill covers a broad area of special-application and production use, while a jig borer covers these same areas (within size limits) and often with greater precision. The boring mill is looked to for heavy boring or milling, while the jig borer does somewhat lighter machining, including milling.

Due to the relatively slow operational speeds of boring machines a long warm-up period was at one time necessary for a machine to stabilize itself through expansion. However, a long warm-up period was not always practicable and error often crept in. Problems of thermal expansion of the components of most machines have today been taken care of by proper use of metals with extremely low

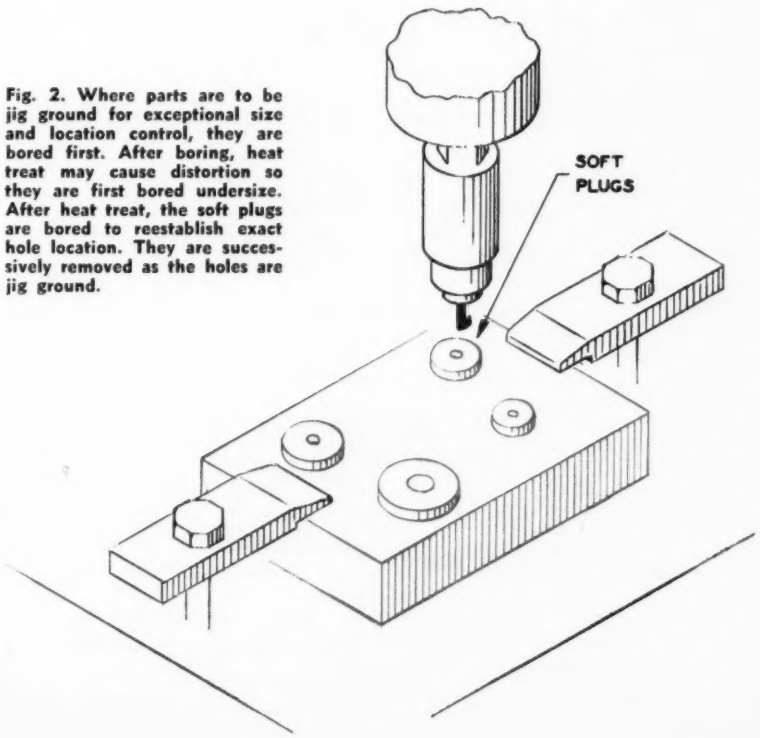


Fig. 2. Where parts are to be jig ground for exceptional size and location control, they are bored first. After boring, heat treat may cause distortion so they are first bored undersize. After heat treat, the soft plugs are bored to reestablish exact hole location. They are successively removed as the holes are jig ground.

thermal expansion characteristics; and if used strategically, uniform expansion is provided.

Although the cost of precision is understandably high, the cost of using a precision boring machine is minimized due to increased efficiency. They are built to precisely locate the work, accurately machine it, and easily inspect it—and they can save much time. They can do in one setup what would require at least three setups with other more laborious procedures. Their use holds accumulated error to a minimum with an almost complete elimination of operator locational or transition error.

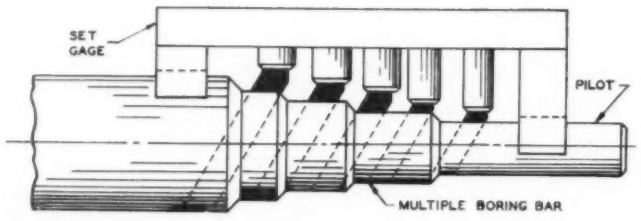
The existence of the jig borer has increased the toolmaker's capacity, and has been one of the most prominent single factors in promoting interchangeability in tooling and production work. Even though a hole for a bushing in a drill jig may not need to be positioned to tenths, it may be cheaper to put it in with a jig borer. If one is available it can be done with greater ease and accuracy than on any other machine.

One reason for the stability of a jig borer is its comparatively low heat generation, eliminating the need for large running clearances. Also, the quill can be fitted in its sleeve to gage tolerances, requiring only a molecular film to separate the surfaces. This film is so minute no working load can displace it.

Precision boring is a must for close hole location preparatory to jig grinding. Accurate location is an easy matter and appropriate grinding stock may be allowed for the final sizing and location.

The use of a jig borer to accurately locate holes that are to be ground on an internal grinder, in lieu of jig grinding, is also common. In this case, after the holes have been bored undersize and the part hardened, they are fitted with soft plugs. During hardening, hole locations may have changed slightly so original locations are *re-established* in the soft plugs with small holes of any diameter, (Fig. 2). Then the true position of each hole is picked up by the grinder spindle by indicating. Plugs are removed and the holes are opened up to exact size. There is a possibility of accumulated error here and accuracy comparable to jig grinding cannot be expected, but the procedure offers a close substitute. Its use will depend on tolerance expectations; there will be times when work should be sent out to a jobber for jig grinding.

For prototype work a jig borer is invaluable. It has the ability to locate and machine, and then analyze and record the parameters involved for use in making production equipment. Jig borers are considered ideal production machines. This is especially so where the production picture does not require enough pieces to warrant a special high production machine. On the other hand, their flexibility makes them particularly valuable for production work where frequent change is a possibility or probability. Often batteries of these machines are found in Industry in direct production.



For setting multiple boring bits a special inexpensive gage may be arranged. It's set up on boring bars with appropriate V-block locators.

As mentioned before, as an inspection medium the machine has few peers. Large plants buy jig borers sans spindle motors so they can be used for no other purpose that might impair their inherent accuracy for inspection.

Their value for inspection is easily understood. Obviously error of some degree can be expected if a workpiece comes out of a machine, and is then re-oriented for inspection. Since the piece is already oriented in the machine, it is foolish to move it if it's not necessary. With the accuracy built into a jig borer's measuring system it is comparable to any *standard* measuring device that might commonly be found in a shop. Too, in measuring on a surface plate, error can occur just from the fact that the origin of a coordinate system is often picked up from some functional, or non-functional, surface rather than from some element within the coordinate system.

A good example of the use of a jig borer as a gage would be where a die member has been rough contoured but not hardened in order that it may be jig bored. Since it is to be mated with another die member, hole locations should be picked up from the hardened mating member. With both mounted on the work table, the jig borer picks up from one part and machines the other.

Admittedly, there is the philosophy that work should be inspected on equipment other than that doing the work. This is a matter of judgment and circumstance.

In order to do the work efficiently, economically, precisely, and with little or no scrap, numerically controlled jog-borers are often found to be the answer. As mentioned before, there may be many who will find it hard to accept the use of a jig-borer as a production machine in light of the capital expenditure for a machine of this nature. Until recently the jig borer did specialized work, but now with pre-programming and N-C, keeping the machine busy is easy. Overhead burden is down and writeoff is quicker.

A machine which had been a necessity for the well-equipped

shop, now fits into the machine-list of the smallest shops.

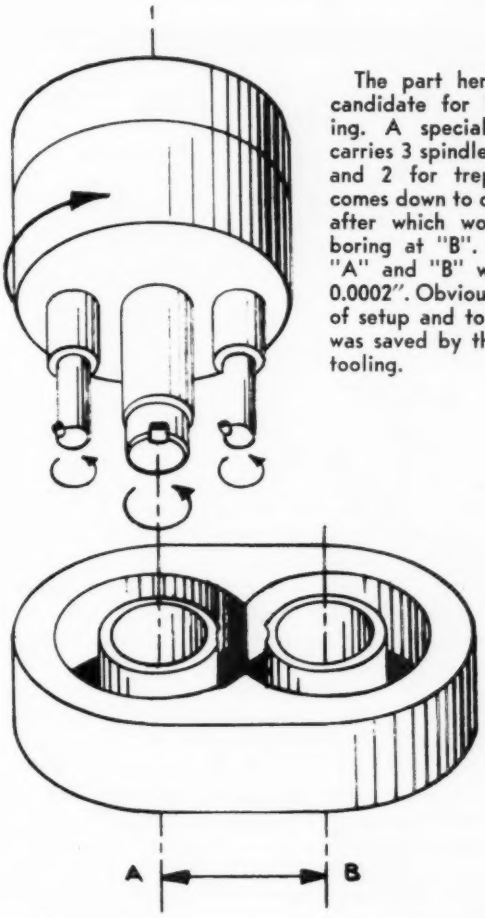
Along with numerical control of the X and Y coordinates, numerical depth control has recently been made available. This feature is especially helpful for small lot boring if accuracies of ±0.0003" or less are required. Regardless of the type of programming, most jig borers can be set up in short order.

Training jig boring operators is no problem, but it goes without saying candidates should be dependable. Tape preparation can be done by competent clerical or office help. Accuracy expectations are usually whatever the machine could produce without N-C. Maintenance costs are no higher than those of other similar equipment; chances are you now have skilled men who can do most of the maintenance work.

Most modern boring machine concepts are an outgrowth of the lathe which, through redesign after redesign, developed into horizontal or vertical boring mills, and horizontal or vertical jig borers. Special boring machines (further developments) are another important part of our machine tool "economy."

Although special machines using components specifically designed for boring machines are efficient and effective, engineering discretion should be carefully applied. Most attempts to make special purpose boring machines from a drill press for instance, or from a milling machine, are fruitless. However, if properly applied, adaptions may be used for limited applications.

In some instances attempts have been made to make jig borers out of milling machines. Even though an identical table movement system is used, the odds are against success. A milling machine is usually gibbed, and with its vertically adjustable knee and sliding table it can't offer the exceptional rigidity required. Milling machine construction is excellent for its intended purpose but construction details preclude their being used for jig borer accuracy.



The part here is a typical candidate for ingenious tooling. A special boring head carries 3 spindles, 1 for boring, and 2 for trepanning. Head comes down to do work at "A", after which work indexes for boring at "B". Index between "A" and "B" was held to ± 0.0002". Obviously a great deal of setup and tool change time was saved by this combination tooling.

MACHINE ADAPTIONS

On the other hand, for certain work it is permissible to spend a limited amount to renovate machines like drill presses and milling machines for special application. For instance, a drill press with adequate power (depending on the application and adaption) can do boring. Where this has been done, a tool adapter is needed, and, most important, a sturdy spindle guide built into the holding fixture.

Adapting a sine plate to the machine table facilitates boring a hole at an angle. A sine plate adaption may also be chosen to offer a larger work mounting area. If only *one* hole is required, an edge of the sine plate may not require alignment with table travel.

Special circumstances or compound angular relationships in hole requirements dictate the use of a rotary table on a sine plate. Through their use any desired compound angle may be attained by combining the two movements.

When holes are to be bored on the periphery of a circular part a rotary table can be used — mounted either horizontally or vertically depending on the machine used. They are available in many sizes and methods of actuation.

Tables with worm and gear actuating mechanisms are popular and easy to use, as are those having pneumatic actuation and the recently developed air-lift feature: A table with this feature enjoys unusual ease of movement

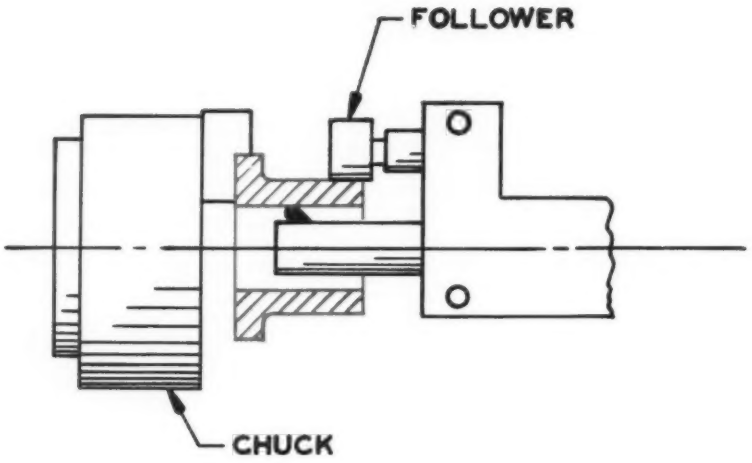


Fig. 3. Where OD and ID concentricity are to be close, boring may be improved by the use of a follower. This is easily arranged to back up the cutter thrust as it bores.

due to the air between the bearing surfaces — a clearance of a thousandth or so is accomplished by plant air. Even very large tables, 5′ x 5′, can be so equipped to easily float the "workplate" into position. After indexing, the same line pressure may be directed to an index pin and clamps. This feature, however, is not needed on small tables.

In setting up production procedures, machines are chosen to suit the job. Many small machines may be capable of doing the machining but their tables may not accommodate the work. It may be feasible to use your equipment for oversize work by the addition of an auxiliary table, extension, and/or support. These are not always standard, so if a standard is not available, the original machine manufacturer will probably come up with an attachment or adaption for his machine.

Hole size control, using single point boring, is dependent upon some means of adjusting the cutter in or out. One adaption is a swivel block chuck which has a wide range of adjustments. It is good in close-quarter work, but since tool adjustment takes place in an arc, graduations on the adjusting screw are not in *true* relation to the movement. This is no great disadvantage since adjustment of any magnitude should be followed by a size check anyway, although there are many places where it may be advantageous to "just set" to a particular size — where like work is to be repeated.

Where frequent adjustment is in true relation to setting, an adapter that moves the tool out in line with the adjusting screw axis is the dovetail offset. It is particularly useful too for producing square shoulders and facing bosses.

The most common boring tools are the general purpose flycutters, and the micrometer adjustable flycutters. All purpose tooling, as mentioned above, may fill in until permanent tooling is delivered.

Another adaption for lathe boring (and there are many) is the slide tool. Often jobs are done successfully without it. However, these are "necessaries" on some work and are nearly always on the shelves of well stocked tool rooms. In use, a slide tool holds the boring bar and readily adjusts for bore diameter and/or turret index error.

It should be noted that even though table movements of boring machines have advanced to the stage of easy use and extreme accuracy, the speed and special features of workholding fixtures pays off—especially on production jobs. Fixtures may be designed and built specifically for the job at hand, or standard fixtures may be adapted to hold the work.

Precision vises, for example, have jaws that provide precise parallel clamping and can hold almost any work for repeat registration with the spindle; standard or special jaws are used.

Probably the most basic and valuable adaption to any boring machine, or lathe, is the chuck. Aside from special chucks, there are the common species having two, three, or four jaws; they are either independent or universal. The independent type has jaws that move individually, whereas the jaws of the universal chuck move in and out together, when adjusted. A combination chuck is equipped for either independent or universal action.

Although it is obvious that round or symmetrical work can be most quickly chucked in a universal, irregular shapes may be set up more easily in an independent chuck. A good example of the universal chuck is the scroll type, which may be equipped with jaws for clamping on the OD or others for clamping in the ID.

Jet engine components, or the like, with large diameters and thin walls, are most easily held in the pinch jaw chuck. These chucks have jaw units which clamp the OD and ID (immediately opposite) for distortion-free holding. Clamping pressure is by plant air, easily controlled. Although each jaw is capable of "pinching" the part with thousands of pounds pressure (or only a few), regulators permit safe use on the most valuable precise "work."

If the part to be bored is of such an irregular shape that it cannot be chucked it is then fastened to a face plate applied to the machine in place of a chuck; it may be fixtured to accommodate the odd shape. When fixturing a face plate,

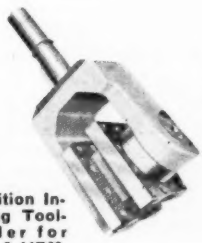
A COMPLETE LINE OF BORING TOOLS FROM DAVIS

LARGEST AND MOST EXPERIENCED MANUFACTURER OF BORING TOOLS

Precision Boring Bars

Standard sizes available. 3/4" to 7" dia. (larger available on request) with choice of block-type or flycutter slots, all types of shanks, and heat-treated or case-hardened finishes. Bars are available in stub and line types for both general-purpose and production work. Custom lengths and arrangements to meet all machining requirements.

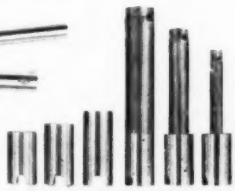
Micrometer-adjustable Stub Boring Tool Sets—in steel case complete with cutters and accessories. Bore range 3/8" to 8".



8-position Indexing Toolholder for VTL & VBM.

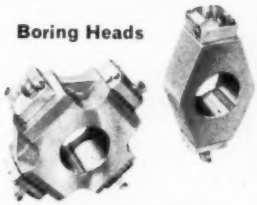
Micrometer-Adjustable Flycutter Boring Tools — bore range 1-1/4" to 9" as required.

Boring Tools



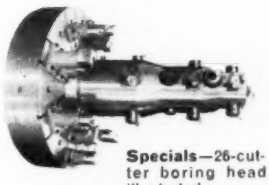
Boring Bars — for VBM and VTL — block tools or flycutter tools.

Boring Heads



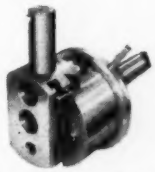
Two- and Four-Cutter Boring Heads — bore range to meet requirements.

Kwik-Size* Heads — rough, semi-finish, and finish with the same tool simply by indexing the cutters.



Specials—26-cutter boring head illustrated.

Extension Boring Heads bore range 9-1/2" to 50" standard. Larger available on request.



Continuous-Feed Facing Heads — 4", 6", and 10" body diameters.

Accessories

Arbors and Sleeves —quick-change type, Morse taper type, adjustable draw key.

Tap-Saver* Tapping Head — Automatic torque control. Drills—reams — taps — spotfaces.

Tru-Plumb* machine aligning tool.

Car Wheel Boring Tools

Block Tooling two-cutter expandable and throwaway tip, single-cutter micrometer-adjustable expandable and throwaway tip, multi-cutter, and solid block cutter types — 3/4" through 17" bore dia.

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D-200

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CIRCLE INFORM-A-GRAM KEY NO. 63

unbalance must always be considered in order to achieve a smooth run for best results and to prevent self-damage.

In putting a chuck on the headstock of a lathe, a block of wood on the bed is suggested to bring the chuck up to spindle height. Or, where chucks are too heavy to be set up by hand, a gimbled-sling is convenient for handling; a bolt from it can be threaded into a hole in the chuck.

To remove a chuck from the lathe spindle, if it is too tight for hand removal, bump it loose with an appropriate length of wood. The wood is placed between the jaws and the chuck rotated until the length of wood hits the bend. This acts as a wrench and inertia will "break" it loose.

Although there are many screw-on chucks still in use, American Standard Spindle Nose Configurations have eliminated the threads —chucks and face plates are now located on a tapered ring. Bolts through the chuck into the spindle-nose hold it in place.

For boring tapered holes on a lathe, a taper attachment on the compound may be used. Attachments are also available for boring on other more specific boring machines. Some boring tools are designed to do taper boring as well as straight holes or facing—the bar may be part of the tool.

A steady rest is often needed to support the work when boring deep holes, especially where the overhang is great. Its use depends on the size of the work, the tolerances involved, the ability of the machine, and the experience of the operator. For border-line cases of boring deep holes, it may be possible to get results without the use of a steady rest by taking a number of light passes—if production time permits.

FIXTURING

When a part is "processed" the possibilities of using standard jigs and fixtures should always be kept in mind. Special tooling also deserves consideration.

Where an OD has been turned, and a related bore requires exceptional concentricity, tooling can be arranged to follow the OD or more appropriately, back it up. A follower can easily be incorporated at the boring station to add rigidity and resist cutter thrust (Fig. 3).

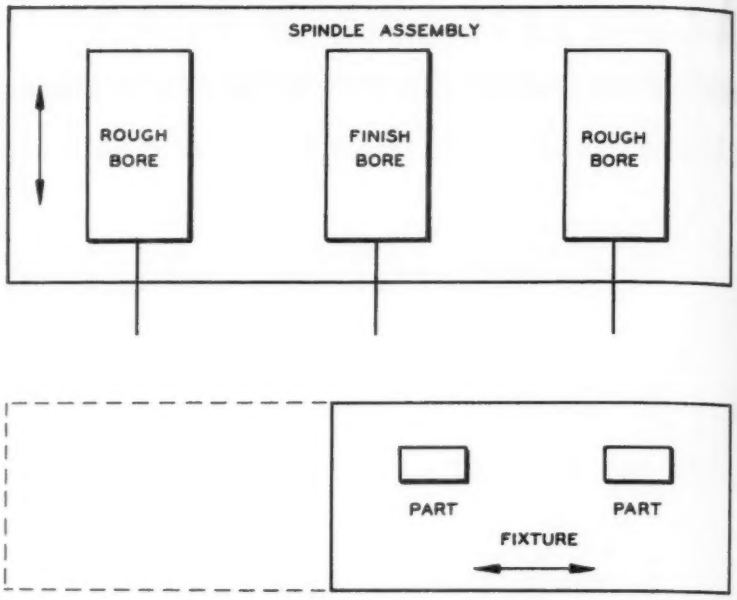
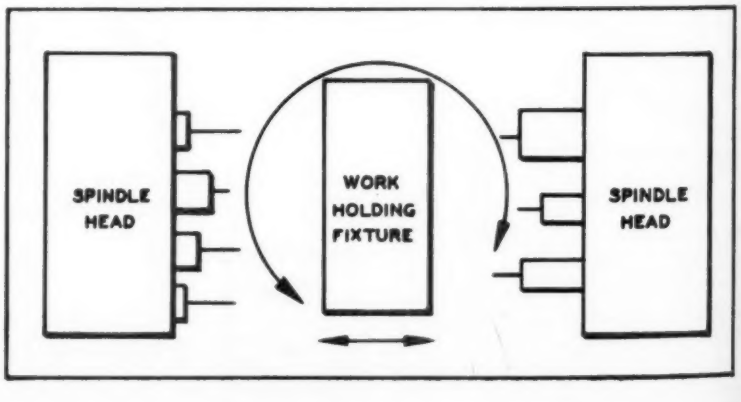


Fig. 4. Plan view of a 3-spindle machine turning out a part at the end of each cycle. Right hand part is loaded and rough bored. Then left hand part is loaded and fixture shifted for roughing it while other part is finished.

Fixtures other than just holding fixtures have for years been replacing the old single purpose fixture-concept. Load-clamp-unload fixtures are, in most instances, not enough to meet today's production requirements. The least that can be done towards fixture efficiency is to provide for the holding of more than one piece at a time, or arrange for machining in one station while loading in another.

Combining three spindles into one machine with appropriate fixturing requires reasonably high production to offset the build cost. However, the economic advantages are easy to see. For instance, if

Fig. 5. Plan view of a multiple boring machine built up with special fixturing and standard machine components. Holes on both sides may have location and/or size in common or not. Or roughing may be done with one bank and finished with the other. Tolerance study should establish the feasibility of indexing to make sure it's within the range of capability of the fixturing proposed.



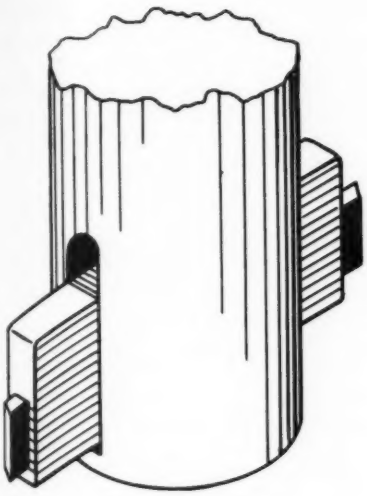


Fig. 6. A floating bit-holder in a bar will offer close size control for a second operation.

rough, finish bore, and facing operations are being done on three machines, these could easily be combined. One fixture could replace the three previously needed, and one operator would do the work of three on one machine, such as is seen in Figure 4.

In operation, the right-hand station of the fixture would be loaded and the spindle assembly would move in, rough boring the part. Then the left-hand station would be loaded, and the fixture moved to its left-hand position. Here one piece is rough bored and the other finish bored, completing the cycle. One piece is finished at the completion of each cycle.

Multiple machining is employed in standard or special machines and more often than not fixturing is an integral part of the machine. Figure 5 shows a plan view of a fixturing approach used when a workpiece is to be bored from both sides. Here the fixture is arranged to move into the spindles — first to one bank and then to the other. The holes on both sides may have size and/or location in common, or neither. Or, as another example, roughing may be done with one bank and finish with the other. In this case the fixture is indexed 180°. However, indexing depends on tolerance; it may add accumulated error greater than tolerance allowance.

Rapid change-over should be kept in mind when fixture designing for any operation where change-over is imminent. This is of special importance since boring machines carry a high overhead burden.

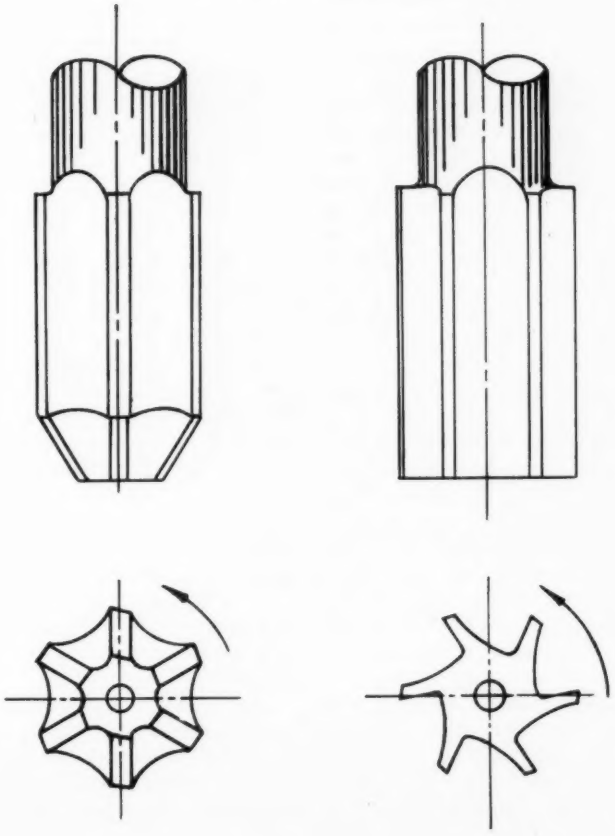
CUTTING TOOLS

In providing a start for a hole the usual practice is to use a center-drill. A spotting tool will give even greater initial accuracy. After the spotting tool, the hole may be opened up by drilling to within a few thousandths of the size to be bored. Special short drills are available for this purpose.

To open a hole reasonably close to the final bore size, boring tools for hogging may be used if desired drill sizes are not available. These are often called sweep tools because of the large chip swept out by a line-cutting action. Usually they are for efficiency, and are not depended upon for location or size. Even so, it's more popular to drill, rough bore (as close as is practical for location and size) and then final bore.

Although much of Industry's

Fig. 7. Two varieties of chucking reamers. Note their stubbiness; they are mainly used for hogging, in which case they are not depended on for close tolerances or fine finishes. They are usually followed by a regular fluted reamer to establish size and produce the desired finish.



boring provides final hole location and size at the same time with single point or two cutter tools, some holes may require careful sizing and finishing with end reamers purchased in sets. If size is likely to be difficult, a sizing reamer may be used (after boring) to remove from 0.005″ to 0.008″ diameter, followed by a finish reamer.

The use of end reamers is often mandatory, but their success depends on good holes to start with. They can't relocate a hole or straighten it. Runout may cause ordinary reamers to mislocate or cut over-size. Since end reamers are short and rigid they are more likely to cut over-size if hole is not "straight-in." In use they are held in a collet whose bore has been ground and lapped to a gage fit with the reamer shank.

Ordinary "rose" or fluted reamers have a greater diameter to length ratio than end reamers and consequently are more flexible. This is important in that they can readily align themselves in holes whose positions are satisfactory. Although reamers are of great value to the toolmaker's boring operation, since their use does not require trial and error adjustments needed with single point boring, they do not have the infinite size possibilities of boring to final size.

Like most reamers, those used for second boring operations are multi-tipped. One type uses two bits set to the proper over-all dimension. The bit holder, in turn, floats in the boring bar slot, like in Figure 6. These tools utilize carbides, ceramics, etc.

Chucking reamers may be used when a number of pieces are to be bored quickly to the same final hole size. Two reamers of this type are seen in Figure 7. These reamers with six or eight cutting edges are ground to effect a specific diameter. Since they do a hogging job, they are not usually depended upon for very close size tolerance — neither can they be counted on for a high finish.

A regular fluted reamer may be run through after the chucking reamer to add finish and bring the hole to "exact" size. By nature, regular fluted reamers are used, as

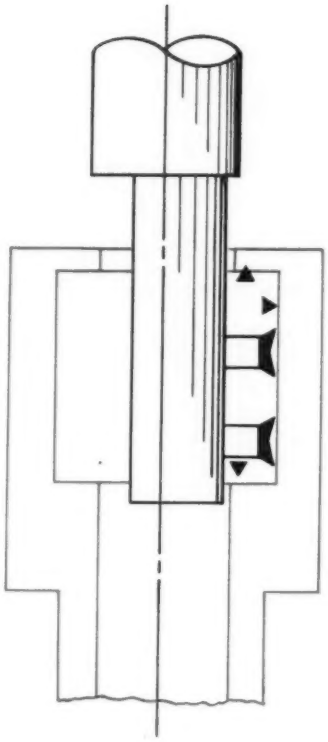


Fig. 8. In this application the work rotates, and facing as well as boring take place. Since entrance hole is small, bar is made eccentric for entrance and moved in or out, depending on the grind, for facing. Up and down movement accomplishes boring without overlap marks if cutters are ground and set properly.

are others, for a very light cut, preferably under 0.010″, (and not over). They may be solid or of the insert-blade variety, and in some cases they are adjustable. Up to 1″ they are usually one-piece; from 1″ up to and including 4″, they are either solid or insert-blade; anything over 4″ is usually insert-blade construction.

Aside from boring bits that are adjustable in a bar, high speed tools are furnished forged with the cutting edge an integral part of the bar. They are purchased in sets equipped with carbide tips if desired.

For production work where repetitive sizes and depths are involved, boring bars are purchased in sets having bits adjustable over a certain range by a graduating screw. They have a consecutive size-overlap and are furnished to cover a wide range over the set.

Where a bore is to be considerably long, with close tolerances, and where production warrants, a bar guide bushing may be necessary. Bars for this can be purchased or built with wear strips to ride in the bushing or guide. These offer uniform hole size throughout a run, and of course give better hole location.

Chip clearance is one of the first considerations in designing a cutting tool. If clearance is not sufficient work will be scratched or torn from the chip "buildup." Also the tool will suffer premature wear. The importance of chip clearance increases as the material being bored becomes tougher and harder.

When a tool is being designed for boring its rigidity should receive major attention. Even with every design advantage, there will be conditions under which a single point tool cannot do its work without some deflection. The possibility of this is the prime reason a tool cutting edge is arranged a little above center. This position lessens the tendency to "dig in" and will go a long way to prevent chatter.

Under certain conditions you may wish to use solid carbide boring bars for added rigidity. This practice may offer enough solidity to eliminate piloting previously needed. Another approach is the use of a carbide sleeve fitted to existing steel bar for the same reason.

In an operation where boring and internal facing are done, as in Figure 8, two tool bits are used. The bar must be eccentric as to shank, for entry through the small bore. In this example, it is necessary to finish-bore from the undercut down to the shelf. Since there are three surfaces two tools work best. One tool faces the undercut and bores halfway down, while the other tool finishes the bore, and faces the shelf below. The two tools must be set carefully to eliminate an objectionable "leave-off" line. Their setting is best done with a V-block gage which locates on the shank of the bar; the cutters are moved out un-

til they touch the pre-set gage surface.

If the bore is deep, as in the example above, it may be necessary to use a tool of this type for roughing and one or more single point tools to obtain the desired finish.

Many carbide cutting tools, holders, and inserts are standardized as to dimension and designation. The American Standards Association bulletins ASA B-5.22-1950 and B-5.36-1957 may be of interest to you.

To bore a recess, deep down in, some method of adding rigidity to the bar is required. However, if the recessing tool is to be fed into its work by feeding the bar laterally, pilot support is not possible. In this case, a special feeding arrangement is necessary. There are a number of standard or special tools available for undercutting, recessing, and back facing. Or, perhaps recesses and undercuts may be designed out. If not, and if the bore is large enough to warrant a special bar, it can include pilot end support and possess internal feeding characteristics.

GAGING

In classes of work where plug gages are adequate the user has a great number of suppliers to look to. For the small extra cost he should look into those with easy entry and removal features.

Air gaging, the means of measuring in terms of variations of pressure or flow in a pneumatic circuit, offers many gaging advantages where bored holes are concerned. The foremost advantage is the minimal wear feature. Since there is a theoretic absence of physical contact between gaging members and work, nozzles and spindles enjoy exceptional life.

Another important advantage also due to the same lack of contact, is the ability to gage easily deformed parts without danger.

Air gages are, for the most part, self cleaning since air is constantly flowing. The readout, used by most suppliers is hysteresis free and can be arranged to suit a very broad range of magnifications.

In setting a dial bore gage, the most prominently used hole gage, you must know the exact size of the ring master. Knowing and applying A.G.D. gage maker tolerances is not enough if your job involves "tenths." The master should be calibrated for its exact size.

Its gaging surface should be scratch and dirt free and the gage should be set while in position of use when gaging workpiece—vertical or horizontal. Look also for differences of reading which might indicate excessive gage head wear. Different readings could indicate plunger tip wear.

If the production "first piece" is to be used as a master, extreme care should be taken to establish its size. However, this is hardly permissible on very close tolerances.

If the gage is set by the flat surface method, stacked blocks must be wrung together properly and again they must be calibrated against collective error. Preferably, they should be held in some device. Needless to say, they should also be clean and scratch free.

Appropriate micrometers can be used to set dial bore gages—even to tenths—but accuracy is not as sure as with the use of masters. It requires good judgment in reading to tenths and then it's easy to lose a tenth by out-of-square alignment of anvil faces and indicator tips.

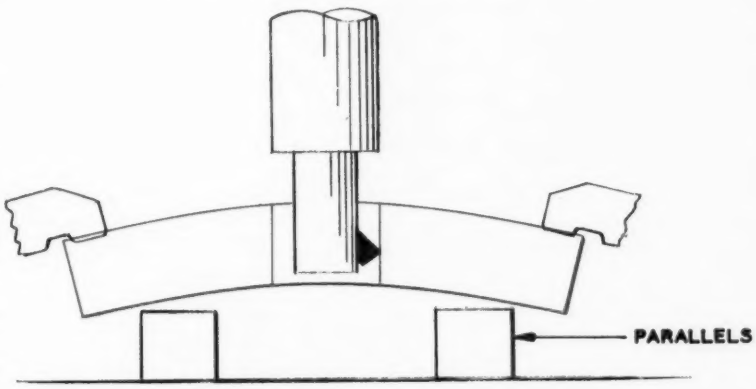
If gage points are worn an error of approximately twice the chord height will be created.

AIDS

In this day of deep hole machining, for the reactor and the space vehicle, for example, tribute should be paid the optical Industry for its boring aids. One of the most prominent pieces of inspection equipment is the borescope, used for deep hole examination. With these, it might be interesting to know, holes as small as 0.093" dia and up to 2.5" dia may be visually inspected. Length parameters are from 3" to 72' (that's 72 ft).

Please turn page . . .

Fig. 9. Although exaggerated, it makes the point that work must be properly clamped. Parallels should be moved out to accept clamp thrust — or clamps arranged to hold work directly over support.



Parallels under flat pieces for cutter and bolt clearance are essential. They are furnished in matched sets in many sizes; the extension type is helpful too where the workpiece is too large to be be clamped to the T-slots of the table.

Clamping the work so that its surfaces remain parallel to the table is a must; clamping must be directly over parallel supports. An exaggerated drawing (Fig. 9) illustrates what can happen when work is not clamped properly. Also to be purchased in sets are the bolt straps and heel rests to provide the operator with an efficient method of clamping a wide variety of work.

Cylindrical work is usually supported in V-blocks; if the workpiece is long it may be necessary to use two. Like other aids where more than one is used these should be matched. And, as in the alignment of any workpiece so that its edge is parallel to table travel, an indicator should be traversed along an edge of V-blocks or parallels for setup.

If great accuracy and convenience are demanded in setting up a boring machine, a locating microscope can easily be used on the spindle. With this magnification accessory, accuracy to tenths is achieved with comparative ease. Its prime purpose is to establish original part orientation to spindle by picking up a hole center on a surface.

As with other machining processes, various metals are best machined while using an appropriate cutting fluid.

In general: Boring cast iron, the low carbon, and simpler steel alloys, can best be done while using a sulphurized oil as a coolant-cutting fluid; the water soluble oils do a good job for stainless, nickel steel, high speed, and high carbon; while the mineral oils are considered best for aluminum alloys, brasses, and magnesium alloys.

Single copies of a reprint of this Report on Boring are free. In quantities, copies are $.75 each for up to 10; $.50 each for up to 25; and $.40 each for more than 25 copies. Address requests to Tooling & Production, 1975 Lee Rd., Cleveland 18, Ohio.

The Lady Knows From Whence She Speaks

Who Said Manufacturing's a Man's World? Now, T&P's lady editor doesn't intend to carry women's suffrage-banners, or even complain about the predominance of men in manufacturing. She's happy, however, that she met another distaff metal-worker—and a very feminine one, at that—at the Tool Show. More uniquely, the lady she met is probably the only lady jig grinder in the country.

Mrs. Smith gives Miss Reuss the "pitch" at the Tool Show.

Mrs. J. P. (Florence) Smith, normally a jig grinder at Federal Products Corp., demonstrated their Sure-set gage at the Tool Show with the finesse of Betty Furness. She not only talked the virtues of the Sure-set, but she put the gage through its paces on a Jones & Shipman universal grinder.

Her running commentary on the operation was all her own, we'll add—a credit to Mrs. Smith's technical and speaking ability, and a welcome relief for the Federal sales promotion staff . . . to say nothing of the masculine visitors!

We asked Mrs. Smith how this all started, and here's the story: She was a jewelry store clerk in 1941 when the war broke out, and she decided to take on the challenge of war-effort production. Her first plant job was as a drill press operator at Federal Products Corp. That lasted a week.

Her innate mechanical ability (and inquisitiveness) came to fore and in short order she was switched to operating a turret lathe. Here again, her mechanical aptitude came forth and before much longer, Mrs. Smith was setting up those turret lathes. So, instead of returning to her home after the war, Mrs. Smith continued with Federal Products as a setup "lady."

Four years ago Mrs. Smith entered very select company when she was picked by the company to operate a Moore jig grinder. The machine's 90" tall and Mrs. S. isn't anywhere near that, so a platform was built around her machine. She's now an accomplished jig grinder, handling master work that requires working to 0.000050" tolerances.

The Tool Show was Mrs. Smith's first fling on the show circuit but she handled her demonstration duties like a trouper. She received instructions on the operation of the gage and the grinder at Federal Products and brushed up on the idiosyncracies of the one at the Show an hour before it opened.

—C.E.R.

Test Time Halved in 100% Q-C Program

A SPEEDY INSPECTION method, which cuts product testing time in half, has contributed to the success of a highly efficient Quality Control program at The Rotor Tool Co., a subsidiary of The Cooper-Bessemer Corp.

The company has instituted 100% inspection of the air impact wrenches it manufactures. Obviously, with a program of such magnitude, they were anxious to reduce testing time to a practical minimum, yet make sure the full value of the Q-C program was maintained.

Previously, the company tested wrenches on a cumbersome torque analyzing device (Fig. 1). It had to be pre-loaded, and its readings were relative only to the specific analyzer, not to actual jobs.

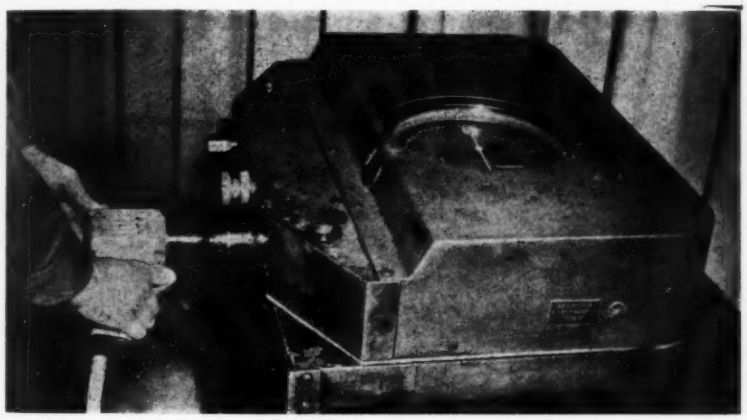
They now use a Skidmore-Wilhelm portable torque tension tester. With the portable tester they make at least three consecutive checks on each wrench. Total testing time is only 90 sec, and because the gage reads directly in pounds of bolt tension, no calculations are necessary.

Here's how it is done. The wrench tightens the master bolt on the tester in exactly the same manner in which it would be used in production. An accurate timing device installed in the air line assures a uniformly consistent time interval for each test. The gage mounted on the tester must show a minimum amount of bolt tension in 1 sec if the wrench is to meet the pre-determined standards. Thus, test laboratory technicians know instantly whether the impact wrench has passed the quality check.

Rotor Tool's Hugh L. Whitehouse, product engineer, points out that wrench users can utilize a similar system to maintain the original quality of the wrenches. "In this way," he states, "proper fastening is assured by knowing that the wrench is delivering the prescribed output for each job."

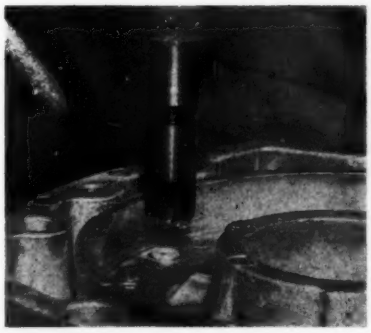
Fig. 2. New tester speeds wrench inspection; gage reads directly in pounds of bolt tension.

Fig. 1. Old method of testing impact wrenches used torque analyzing device which had to be pre-loaded. Bolt tension had to be calculated from gage reading.



Carbide Boosts Life Of Rivet Spinner

Tool maintenance costs and machine downtime were greatly reduced when a maker of die cast aluminum housings used a carbide rivet spinning tool to replace the hss tool formerly used. In an initial run of 36,000 pcs, the company saved $1338 and cut downtime by 14 hrs. The new tool produces a better finish and has eliminated the tearing of rivets caused by galling of the tool.



The riveting operation consists of cold spinning five aluminum rivets which fasten a horseshoe shaped part in the housing. The rivets have a 5/16" OD and a 1/16" wall. Riveting is done during an automatic cycle with the tool spinning at 3600 rpm.

The sequence starts with a light contact to heat the rivet. The tool is then retracted enough to permit mist spray lubrication, and moved down again to complete the cycle.

The Kennametal K82 hard carbide tool now used is a 9/16" bar, 3-5/16" long, with a rivet spinning head on each end.

Valvair® deceleration manifolds provide safe, velvet-smooth control of high-speed press transfer shuttles

Performance of Valvair deceleration manifolds on press transfers maintains a steady high rate of production through a major automotive manufacturer's fully-automated 5-press stamping line. Valvair design assures necessary rapid movement of the transfer mechanism, with precisely controlled deceleration of the 200 lb. shuttle at each end of the cycle. And, positive cushioning of shuttle travel prevents damage to the transfer mechanism . . . protects valuable dies.

Valvair's deceleration manifold assembly uses only three SPEED KING valves; two to control cylinder movement, and one as a directional valve to select free or restricted exhaust for cushioning. Just two limit switches are needed to control cushioning action — a quick adjustment of exhaust restriction precisely regulates cushioning rate. Simplicity of design, plus SPEED KING multi-million cycle dependability, assures peak production rates, with minimum in-service downtime.

If control of fast-moving reciprocating mechanisms is a problem in your plant, ask your nearby Valvair representative for his recommendations. He's only a telephone call away.

This press transfer indexes 26 in. per cycle, at a 1,000 cycle/hr. rate. Valvair's compact, 3-valve deceleration manifold controls its horizontal movement . . . requires minimum mounting space . . . simplifies piping and wiring.

For more information, write for Bulletin G-3A. Address Dept. TP-660, Valvair Corporation, Akron 11, Ohio.

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8018

CIRCLE INFORM-A-GRAM KEY NO. 70

Talking About Die Sets

with
Phil Marsilius
Executive Vice-President
The Producto Machine Co.

Die Set Maintenance in the Pressroom—The vital die-maintenance procedures required periodically when a die is removed from the press for sharpening should be coupled with systematic die set inspection and maintenance in the pressroom.

In addition to having a planned schedule of lubrication (based on any of the methods previously discussed in this space), you can make sure of getting the most out of your investment in die sets—and the costly dies and presses with which they are used—by following a simple set of procedures for inspecting and maintaining die sets in the pressroom.

Although there are no hard-and-fast rules that can be established for all die sets, the procedure listed below is generally followed at leading stampings plants in the East. These companies point out that die sets used in the cutting of extremely thin material or for very critical parts would naturally require a more stringent inspection than those used for blanking heavy material or for comparatively simple parts.

At one plant, specializing in long runs of close-tolerance parts for the electronics industry, the procedure followed is:

1. No inspection of the die set during production run unless, of course, there is overheating, pick-up on the guide pins or other obvious difficulties.

2. When the die is taken off the press for sharpening or maintenance, the die set is visually inspected for pick-up or score marks on either the guide pins or bushings. Pins and bushings are carefully cleaned to remove excess lubricant.

3. After approximately 1,500,000 strokes, the set is thoroughly checked for wear on both the pins and bushings. On the average, up to .0003" wear on pins and bushings is allowed before replacement with new components is scheduled. In addition, the die set is placed on a surface plate and an indicator is placed over one end of the set. An attempt is then made to rock or twist the set by hand to establish how much the die set can be deflected. On a 10" set, a maximum of .005", but usually less, total deflection is allowed.

Because the die set plays such an important part in prolonging the accuracy and lifetime of a die, it pays to take the little extra time required to do justice to die set maintenance in the pressroom.

4. During regular or periodic regrinds, the die set is not checked for bent or distorted punch and die holders unless the die has been damaged or there is reason to believe the set may have warped.

During the overall period, if the pins and bushings are replaced, the punch and die holders themselves are checked for warpage or distortion. If necessary, these components are reground prior to assembling the new pins and bushings.

Why the pressroom foreman prefers Producto die sets

Four-stage blanking and shaving die, Lenkeit Machine & Tool Co., Inc.

They keep his downtime down

Keeping production *up* and downtime *down* is the main job of the pressroom foreman. He knows Producto die sets can help him do this job successfully because they maintain accuracy for long runs. All catalog steel sets are annealed to prevent distortion.

He is aware that Producto can provide him with any type of die set he needs—whether for standard or special presses—in a wide range of sizes and thicknesses, with or without clamping flanges.

The pressroom foreman knows that Producto guide pins are mirror-finished to eliminate scoring, and that Producto die sets are available with a variety of lubrication devices to keep them "running cool".

He knows, too, that he is not restricted to the use of predetermined press stroke or shut height because Producto offers an unlimited choice of pin and bushing lengths. Moreover, he can get the bolster he needs to protect his die at the same time he gets his die set. Both die set and bolster can be ordered in steel or cast semi-steel depending on strength requirements.

The pressroom foreman realizes that Producto Qwik-Fit Die Sets make "take-apart-and-put-together" easy during die maintenance. He also knows that Qwik-Fit removable pins and clamp-type bronze bushings are available when the application calls for them.

He can *produce more* with Producto die sets. So can you.

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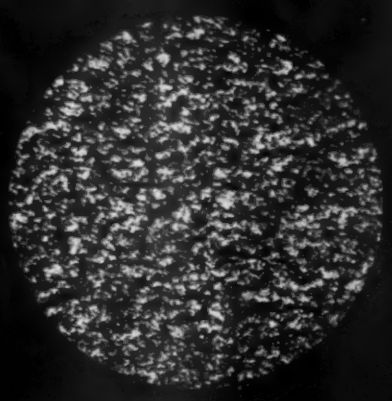
CIRCLE INFORM-A-GRAM KEY NO. 71

THESE SURFACE TRACES PROVE YO

when you use Formbrite, Anaconda's superfine- grai

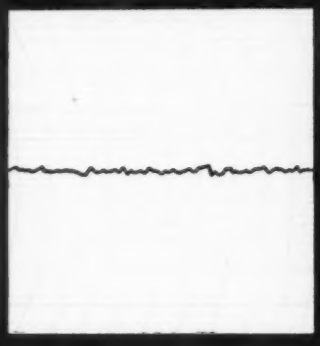
STANDARD DRAWING BRASS
(grain size, .045 mm) – after 40% elongation

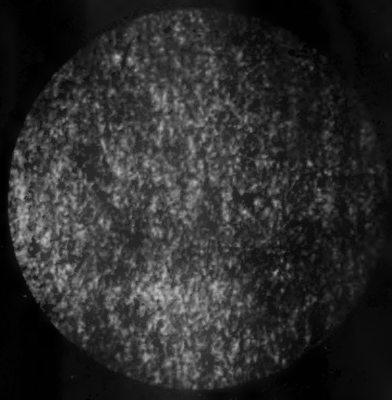


ENLARGED SURFACE TRACE showing the roughness that causes "orange peel" effect in the working of standard drawing brass. Smoothing such mountains down to the valleys takes a lot of cutting—cost of polishing compounds runs high—production is low—bottlenecks hamstring operations.

THE SURFACE of the stretched standard drawing brass sample looks like this when seen in oblique illumination and magnified 20x. For small deep-drawn products, it might take up to five polishing wheels to finish a surface with roughness of this order—even at low machine speeds.

FORMBRITE DRAWING BRASS
(grain size, .005 mm) – after 40% elongation





ENLARGED SURFACE TRACE showing Formbrite's smoothness even after deformation, the test of polishing characteristics of a drawing brass. Little hills like these are easy to level. The trace explains why polishing savings reported by Formbrite users are usually 40% to 50%.

WHEN SEEN IN OBLIQUE ILLUMINATION and magnified 20x under the microscope, the stretched Formbrite surface looks like this. Even in such deep-drawn products as pen caps, only a light cut and a color buff are needed for a jewelers' finish—often a color buff alone does the job.

Despite its superiority, Formbrite costs no more than standard drawing brass. It is produced in the following brass alloys: Yellow Brass, Cartridge Brass, Gilding, Commercial Bronze, Red Brass, and Low Brass. The Formbrite process is also applied to brass wire alloys for cold-heading and upsetting purposes—for a stronger, springier, more abrasion-resistant product.

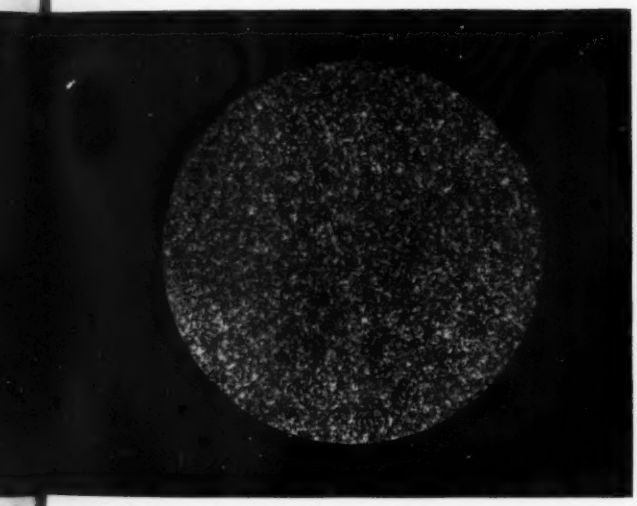
Get the full details from your American Brass representative, or write: The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

6049

YOU CAN CUT POLISHING COSTS

grain drawing brass

THIS IS THE MICROSTRUCTURE of the standard drawing brass sample at 75x magnification. The coarse grain structure is typical of the drawing brass that has for decades been used for stamped or drawn brass products. It is the basic reason that polishing costs have run high.



THIS IS THE MICROSTRUCTURE of the Formbrite sample, magnified 75x. The uniform, superfine-grain structure, produced by special procedures of rolling and annealing, explains the relatively smooth surface trace of the stretched Formbrite sample, at the left.

FORMBRITE®

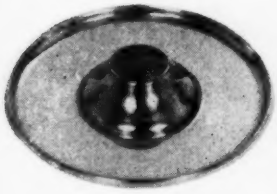
Superfine-grain drawing brass

A PRODUCT OF

ANACONDA®

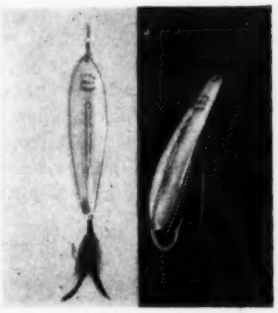
MADE BY THE AMERICAN BRASS COMPANY

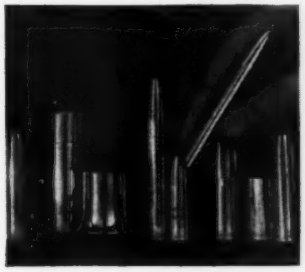
The outstanding feature of Formbrite is easy polishing. But there's something else you should know about it. Formbrite is stronger, harder, springier, and more scratch resistant than the usual drawing brasses. Yet it retains remarkable ductility for forming, stamping, drawing, and embossing. In many instances, these qualities have made it possible to use thinner gage metal.



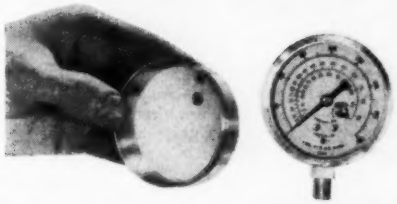
The maker of this tray, after switching from ordinary drawing brass to Formbrite, found he had achieved a cost reduction of 25% in the cutting operation and 42% in the finish buff—and a healthy boost in production rates.

These fishing lures, first made from ordinary yellow brass, are polished for plating by tumbling. After the switch to Formbrite, manufacturer found he had cut his polishing costs 40%. Small-size formed, drawn, or upset parts made of Formbrite often can be satisfactorily finished by the relatively low cost conventional tumbling methods.





A jewelers' finish on these deep-drawn products meant the use of five polishing heads, with regular drawing brass. With Formbrite, manufacturer uses two polishing heads for a light cut, another for a simple color buff, and runs machines faster. Savings run up to 40%.



When this gage case was made of Formbrite, the instrument manufacturer found he could drop the cutting operation and get a "mirror finish" with a light buff. The saving in finishing cost was 40%.

CIRCLE INFORM-A-GRAM KEY NO. 73

Midwest Industries Grow

CHICAGO — Beaver Industries has doubled the size of its W. Adams St. plant. The addition includes loading facilities, a new display room, and more area for rebuilding automatic screw machines.

Other recent plant expansions or acquisitions include these:

• Establishment in Detroit of a factory branch office and warehouse by Seibert & Sons, Inc., Chenoa, Ill., manufacturer of holding tools and spindle equipment.

• Formulation of plans to purchase an eight-acre site near Palation, Ill., by Elgin National Watch Co. The 15,000 sq ft research and engineering plant for Elgin Micronics should be ready this Fall.

• Establishment of a new computer laboratory within the engineering department of National Broach & Machine Co., Detroit.

Coming Events:

June 5-9. American Society of Mechanical Engineers' summer annual meeting and Aviation Conference, Statler Hilton Hotel, Dallas, Tex.

June 5-10. Society of Automotive Engineers' summer meeting, Edgewater Beach Hotel, Chicago.

June 6-8. Material Handling Institute New England Show, Commonwealth Armory, Boston.

June 14. Metal Cutting Knife Association meeting, Sheraton-Cleveland Hotel, Cleveland.

June 19-21. Alloy Casting Institute annual meeting, The Homestead, Hot Springs, Va.

June 20-22. ASME Applied Mechanics Conference, Pennsylvania State University, University Park, Pa.

June 21. Machine Knife Assoc. meeting, Edgewater Beach Hotel, Chicago.

Pure Titanium Nitrides Well

WASHINGTON, D. C. — The Navy may turn to nitrided pure titanium as a sturdy material for fuel control valves in carrier-based jet planes.

A recent National Bureau of Standards study for the Navy Bureau of Weapons showed that nitrided, unalloyed titanium gave the surface hardness, impact resistance, and resistance to salt water corrosion needed in the part. These valves must function under extreme temperature and pressure loads in a corrosive atmosphere.

Since titanium has good salt water resistance, plus a strong affinity for nitrogen, it was selected as a base metal for experimental valve production. An alloy of titanium - aluminum - vanadium proved faulty after nitriding, but pure titanium retained its impact strength.

Pure titanium's uniform nitrided case measured 0.0005″ thick after 48 hrs of treatment. It increased in thickness with an increase in nitriding time, up to 0.008″ after 168 hrs.

New 'Ear' For Army 'Space-Tapping'

Heart of Army's new electronic "ear" are these three components —tiny synthetic ruby at left, copper transition section at right, and magnet in foreground.

WASHINGTON, D. C. — A tiny electronic "ear" with a gigantic reach may soon go to work for the Department of Defense to listen in on happenings millions of miles out in space.

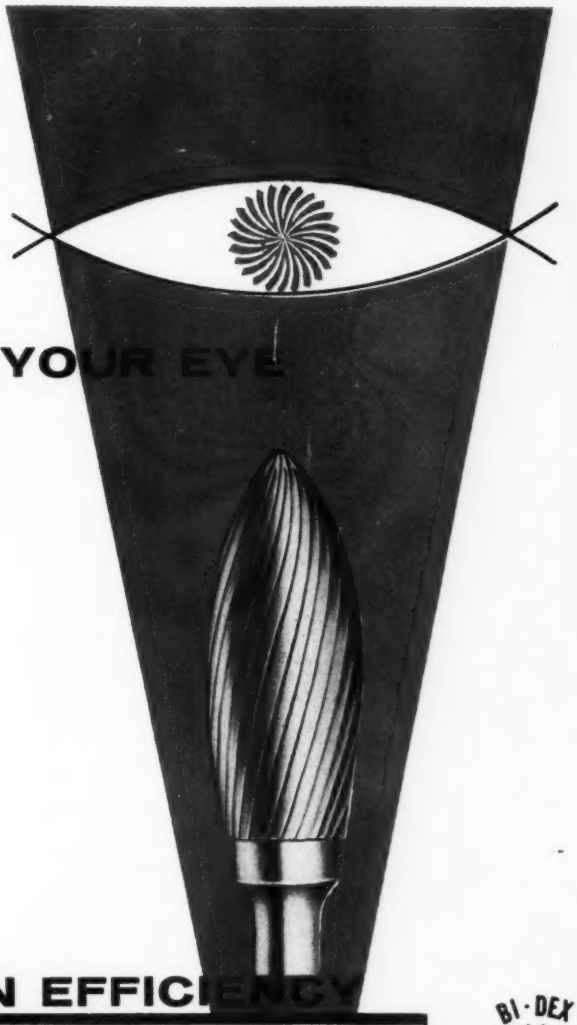
Heart of the device is a synthetic ruby, ½″ square, which sells for five cents a carat. It's contained in a 25-lb package called a "ruby maser" amplifier, developed for experimental use at the Army's Ft. Monmouth, N. J., R&D labs by Hughes Aircraft Co. "Maser" is an abbreviation of Microwave Amplification by Stimulated Emission of Radiation.

In operation, the ruby is cooled to −452°F by liquid helium. This slows movement of the ruby's atomic particles, filtering out interference, and enabling the gem to detect and amplify fantastically faint signals from "way out."

Projected uses are these: 1) to detect radio "beeps" from space vehicles millions of miles away; 2) to detect approaching ICBMs far sooner than can now be done; 3) to pick up signals from distant stars; and 4) to eventually facilitate communication between space vehicles. It's supposed to extend by tenfold the range of current Army electronic systems.

Norton Celebrates 75th Anniversary

WORCESTER, Mass.—The opening of a $6½-million plant for the manufacture of organic bonded grinding wheels kicked off the celebration of its 75th anniversary last month by Norton Company. Plant 8 incorporates automatic equipment for the speedier production of resinoid, rubber, and shellac bonded wheels.



BI-DEX* KEEPS YOUR EYE ON PRODUCTION EFFICIENCY

BI-DEX

FACET TOOTH

BI-DEX* Tungsten Carbide rotary files by Grobet File Company of America, Inc. — a revolutionary new design that eliminates the "dead area" at the head of the burr, reduces chatter and build-up of chips.

If you want to keep your eye on efficient production also ask for a demonstration of the new **FACET TOOTH*** file, another momentous recent innovation in file construction, designed for greater cutting speed, longer life and greater efficiency.

BI-DEX* and **FACET TOOTH*** T.C. rotary files are available in a number of shapes and sizes.

GROBET-U.S.A.

Order from your distributor or write directly to

*Trade Mark

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CIRCLE INFORM-A-GRAM KEY NO. 75

Q FACTORS *

Q is for Quality. And with ACE, Quality is not just a word, it is a commodity. *When you buy an ACE DRILL BUSHING you are buying Better Steel, Greater Precision, Closer Tolerances, Consistent Concentricity and many other factors that make up the sum total of Unsurpassed Quality.*

* **STEEL** . . . The best available for longer wear. Chosen because it saves you money, down time, production losses.
* **PRECISION** . . . The result of painstaking craftsmanship, super finishes. Saves on Drill life, too.
* **TOLERANCE** . . . If your work demands the best, you can depend on ACE DRILL BUSHINGS to give you the best.
* **CONCENTRICITY** . . . .0003" t.i.r. — .0001" if requested.
* **PRICE** . . . ACE Quality costs no more. The longer the life, the less your invested cost. Dollars go further.
* **AVAILABILITY** . . . Three factories, three factory warehouses and more than 200 distributors with huge stocks is your assurance of fast effective service anywhere in the U.S. Overnight delivery if required.
* **FACTORY STOCKS** . . . Over 2-million bushings in stock. Many special sizes are Ace standards. Unbelievably fast service on all sizes.

Write Today for Latest Catalog of Ace Bushings, Punches, Dies and Guides

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CIRCLE INFORM-A-GRAM KEY NO. 76

Film Festival

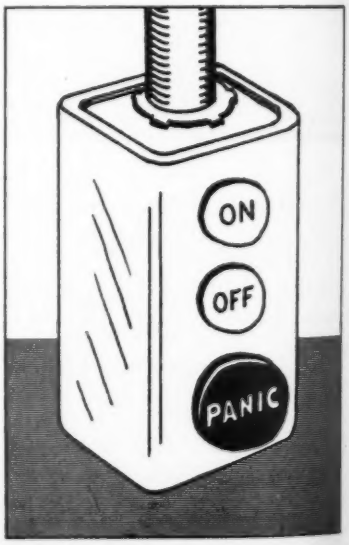
For correct operation, and the best results from large production, semi-production, and maintenance type threading machines, get some tips from a 16mm color film. Entitled "Silver Threads Amass the Gold," the film is available on a free loan basis from The Oster Mfg. Co., 1340 E. 289th St., Wickliffe, Ohio.

An automatic drill point grinder is shown in action in a 10-min, 16-mm color film. The Model 100 Winslo-Matic produces various types of drill points, with a sharpening capacity from 1/32" through 1½". Contact Winslow Product Engineering Corp., Arcadia, Calif., for information.

More than 80 films describing work simplification and industrial engineering techniques are included in a 1960 film rental catalog. Produced by leading American companies, these films are about 10 to 15 min. long. Write Industrial Management Society, Suite 1310, 330 S. Wells St., Chicago 6, for your copy of the booklet.

Fundamental principles of measuring with air pressure are described in a 16mm color film. "Dimensional Gaging with Air" shows actual test and applications. Federal Products Corp., 1144 Eddy St., Providence 1, R.I., lends the film on a free loan basis.

Shop Talk



Machine Control for Beginners

New MODEL 50 equips your lathes to do a lot more for a lot less!

$70.00 for the chuck

$65.00 for the collets

THE WORLD'S MOST MODERN COLLET CHUCK

Designed expressly for ATLAS, CLAUSING, DELTA, LOGAN, SHELDON, and SOUTH BEND LATHES

These and others of similar power and capacity now give top performance when equipped with the new Jacobs Model 50. Improve performance of your lathes. Increase spindle capacity as much as 42%. Get greater accuracy and stronger grip. It's easy and inexpensive with new Model 50 and its companion Rubber-Flex collets.

CONSIDER THESE FEATURES . . .

- **Gripping Power**
  Model 50 is made for heavy duty turning. It has tremendous gripping power.
- **Accuracy**
  Model 50 is factory tested—maximum runout .001" T.I.R. at the nose when properly mounted.
- **Thin Walled and Fragile Work**
  Always parallel Model 50 Rubber-Flex collet jaws permit chucking of tubing and fragile materials without crimping or scoring.
- **Range**
  The 10 Rubber-Flex collets in the 500 Series, developed especially for use with Model 50, cover a greater bar stock range than 63 old-fashioned steel collets. You can chuck any bar between 3/32" and 1-1/16" with this set of 10 collets.
- **Capacity**
  Model 50 eliminates capacity-wasting draw bar. You can increase spindle capacity up to 42%.
- **Adapters**
  Model 50 adapters are fully machined for immediate mounting. Available in all popular threads and American Standard L00 taper.
- **Price**
  Model 50 prices are revolutionary!
  $70.00 for the chuck.
  $65.00 for the complete set of 10 collets.

MODERNIZE YOUR LATHES WITH JACOBS MODEL 50 AND RUBBER-FLEX COLLETS. YOU CAN'T AFFORD NOT TO!

See your Jacobs industrial supply distributor. Give him the opportunity to prove these fantastic facts with a convincing demonstration at your desk! Call him today.

Jacobs CHUCKS

The Jacobs Manufacturing Co., West Hartford 10, Conn.

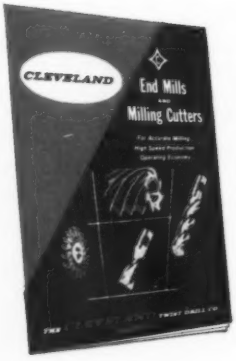
CIRCLE INFORM-A-GRAM KEY NO. 77

NEW

Over a period of years we have continually enlarged and improved our line of CLEVELAND End Mills. Now, with the addition of the wide range of CLEVELAND Milling Cutters shown on the opposite page, you can specify a CLEVELAND Cutter for every application . . . and know you are getting lower cutter cost per cubic inch of material removed.

CLEVELAND Milling Cutters assure maximum metal removal per grind. Wide chip space between teeth enables these cutters to perform smoothly in the most difficult materials. Correct axial, radial rake and relief angles provide efficient operation under all conditions. Moreover, CLEVELAND Milling Cutters reduce regrinding time by requiring minimum amounts of stock removal when resharpening.

Take advantage of these time-saving, money-saving features. Specify CLEVELAND Milling Cutters on your next milling application!



Write for Your Copy of This Helpful Book

This 64-page illustrated book gives complete information on all types of CLEVELAND Milling Cutters—Plain, Side, Half Side, Corner Rounding, Concave, Convex, Woodruff Key Seat, Angle, Metal Slitting, Screw Slotting. Also full information on CLEVELAND End Mills. Ask for your copy.

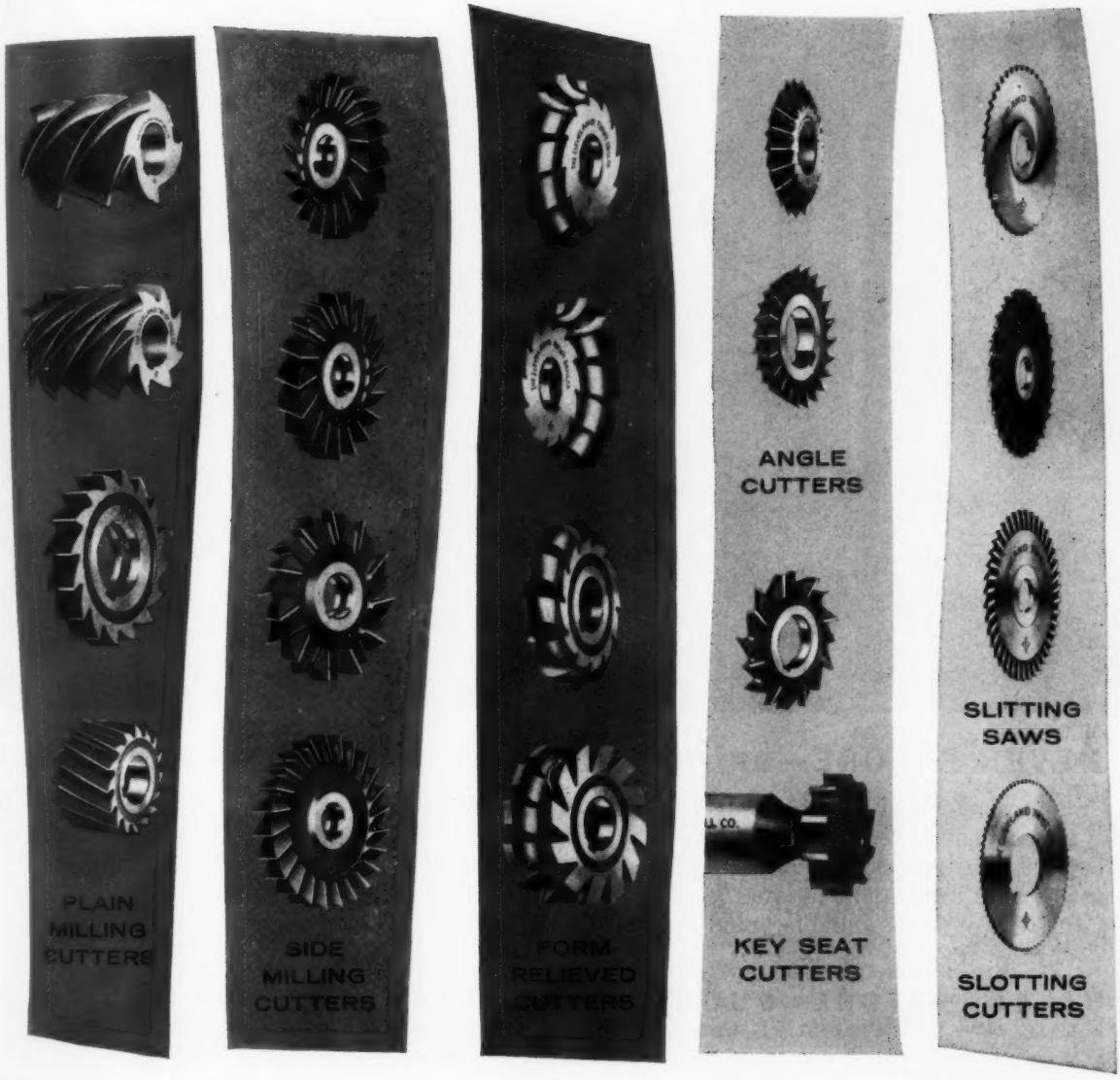
THE CLEVELAND TWIST DRILL CO. CLEVELAND, OHIO

INDUSTRIAL DISTRIBUTION SERVING INDUSTRY ECONOMICALLY THE RIGHT HAND OF INDUSTRY

Telephone Your Industrial Supply Distributor

Your CLEVELAND Distributor can give you good service on CLEVELAND Milling Cutters and the complete line of CLEVELAND ◇ Quality Tools

CLEVELAND MILLING CUTTERS



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THE CLEVELAND TWIST DRILL CO.

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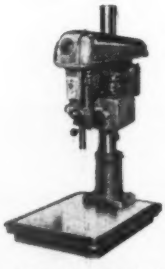
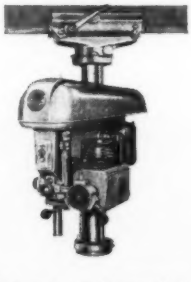
NEVER BEFORE—UP FRONT CONTROL WITH ONE HAND OPERATION

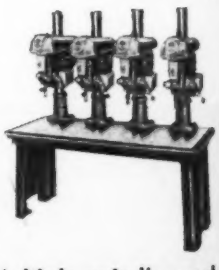
Unique pilot wheel control is mechanically integrated with the clutch control, allows operator to engage power feed with a simple wrist movement of one hand. Without any adjustments, operator can use rapid manual approach then power feed, skip drilling technique, straight power feed or straight manual feed. There are four feed ratios—.004, .006, .009 and .012 ipr—with each of five available spindle speeds.

NEVER BEFORE—SUCH A COMPLETE CHOICE OF MODELS

Floor model


Bench model

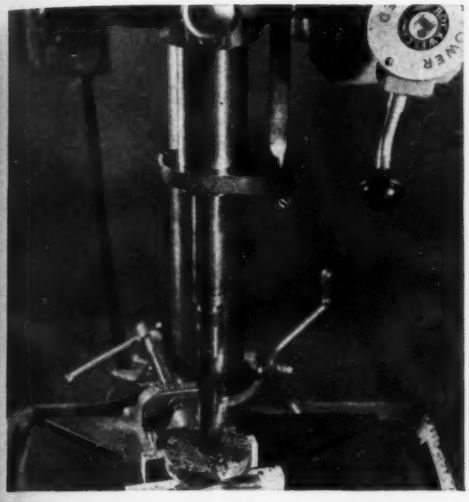

Overhead model


Multiple spindle model

ROCKWELL ANNOUNCES . . .

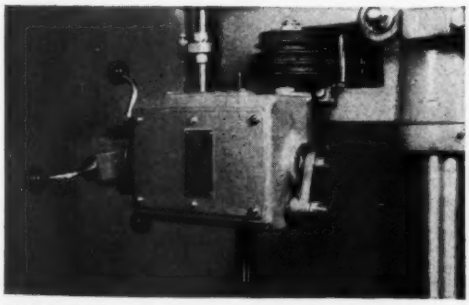
NEW POWER FEED

on famous DELTA 20" drill presses



NEVER BEFORE—"JOB TAILORED" DRILL POINT PRESSURE

A lathe-type cone clutch enables operator to adjust drill point pressure from 0 to maximum capacity of machine to permit power feeding on a production basis through a wide range of hole diameters. It furnishes power and thrust for drilling holes up to 1", yet delicately handles drills down to 1/16" diameter. Torque sensitive adjustability feature stops feed when overloaded—avoids drill breakage.



NEVER BEFORE—REMOTE CONTROL AND AUTOMATION

Actuating plunger, an extension of the clutch shaft, permits remote control which frees operator from manual effort. The power feed can be electrically, hydraulically, pneumatically, or mechanically interlocked with other machines or synchronized with devices such as rotary tables, clamps and work feeds for semi or full automatic operations.

Now Delta brings you advantages NEVER BEFORE AVAILABLE on a standard drill press—with the most advanced development in mechanical power feeds. Every model in the new Delta 20" drill press line offers power feed that gives you: *a front mounted pilot wheel for effortless one hand operation; infinitely adjustable drill point pressure; built-in feature that permits remote control or interlocking with automation devices.*

With the flexibility of feeds afforded by "flick of the wrist" control, operator's work is limited to loading, unloading, and actuating the tool. You get the adaptability of a power tool with the ruggedness, precision and capacity of a machine tool. Capable of handling production metalworking jobs done by machines costing much more, these new Delta power feed drill presses provide a simple, low cost method of increasing productivity and improving drilling quality.

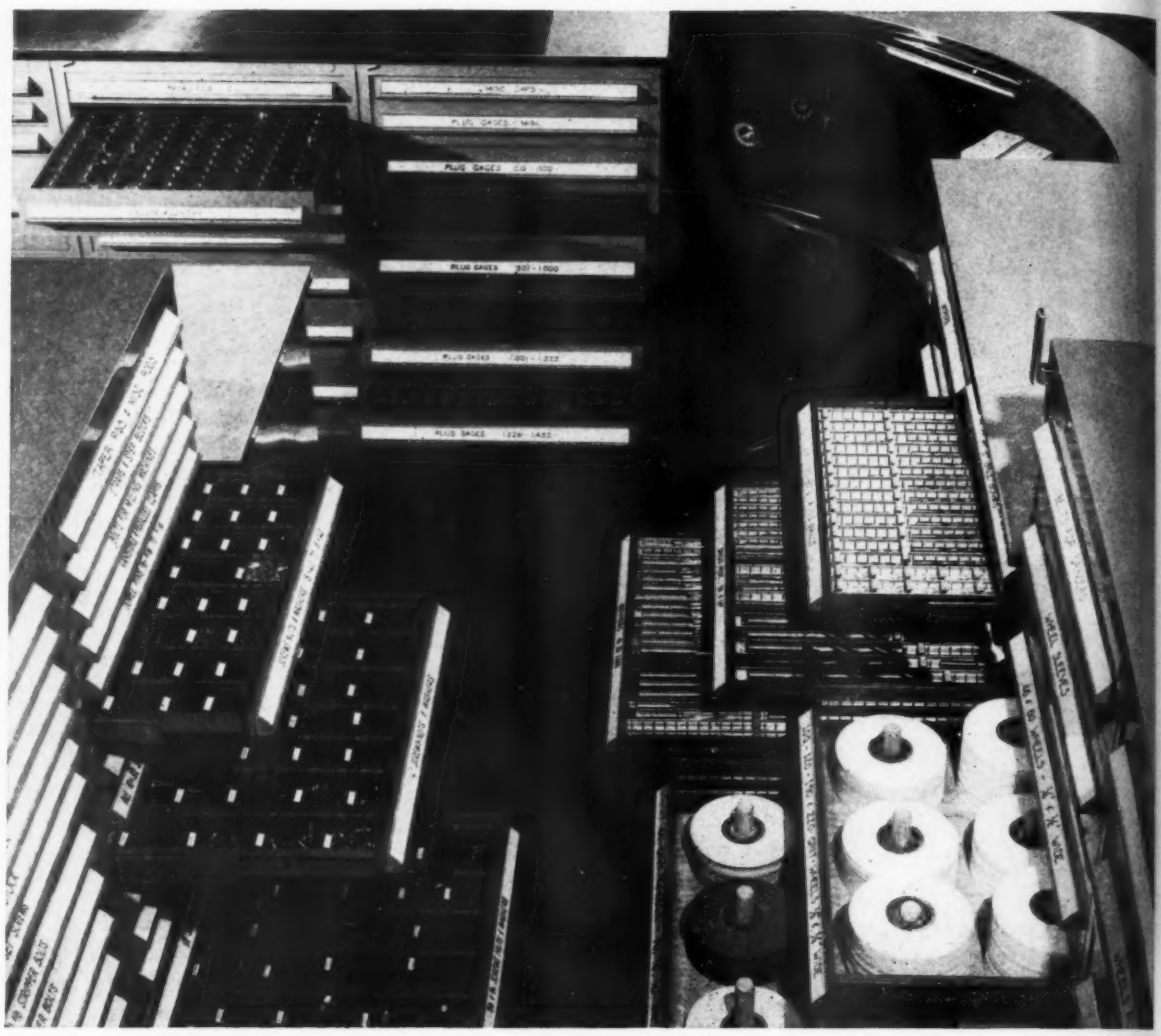
Thoroughly tested through a rugged trial of 750,000 drilling cycles, Delta's new power feed line offers many other outstanding features and NEVER BEFORE AVAILABLE benefits that you cannot appreciate unless you see them demonstrated IN ACTION. Let your Delta Industrial Distributor show you how the 20" power feed drill press can help you cut costs (he's listed under "TOOLS" or "MACHINERY" in the Yellow Pages). Meanwhile, for FREE brochure giving details and specifications *plus* information on how to add New Power Feed to your present Delta 20" drill press, write: Rockwell Manufacturing Company, Delta Power Tool Division, 622F N. Lexington Avenue, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ontario.

DELTA INDUSTRIAL TOOLS

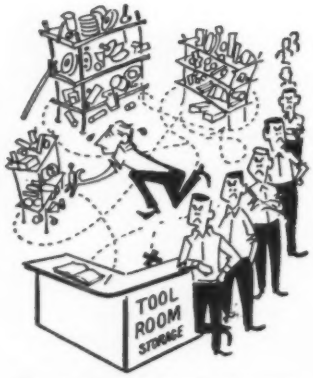
another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 81



This storage space makes money



THIS ONE DOESN'T. *Outdated storage—disjointed, harum-scarum—keeps skilled workers waiting needlessly. Everything hard to see, hard to find, hard to keep track of.*

HOW? By putting more spare parts, tools, gages, fixtures, assemblies and components into a given area than could possibly be fitted into outdated tool cribs or storage bins. And by keeping them close at hand, fully visible...absolutely safe from damage, loss, dust or pilferage.

Vidmar industrial storage units are of heavy gauge steel. Cabinets come in various heights, and so do drawers—which can be partitioned in unlimited arrangements. Drawers are strong, holding up to 400 lbs. each! All units are modular...can be moved, interchanged, re-arranged, and added-to as required from year to year.

BEFORE YOU revise or add to your storage facilities, it will pay you to check Vidmar industrial storage units. Write today for descriptive literature. VIDMAR, INC., 2326 Reach Road, Williamsport, Pa.

Store more...better...in less space with

Vidmar CABINETS

Division of VOLKERT STAMPINGS, INC.

CIRCLE INFORM-A-GRAM KEY NO. 82

Diagram shows air flowing to one side of a double acting cylinder from outlet 6 while being exhausted through hole 5 on other side of cylinder. When the right poppet is touched, air is bled from chamber 3 and piston(1) is shifted to right. At this point, air is exhausted through port 6 as air enters opposite side of cylinder.

Here at last is the air valve which makes "automation with air power" absurdly simple. No expensive, delicate electrical circuits are needed! It's air pressure alone--distributed through slender, flexible hose—that does the work with the same instantaneous response of electricity.

A light momentary touch on the miniature limit switch actuates the main valve piston, which moves from side to side like a shuttle, clearing first one air passage and then the other. The piston is moved by releasing the air on one side through the limit switch. Regardless of amount of air pressure, a featherweight touch releases air, shifts piston.

The limit valves can be mounted at points where they will be tripped by the moving parts of a working machine, such as the ram of an air cylinder, the moving table of a milling machine, the depth stop rod of a drill press, or a revolving cam on a shaft.

Cost-saving possibilities are almost unlimited! Now clean, quick, dexterous air power can be directly integrated with mechanical functions of many production machines. New worlds open to original equipment manufacturers!

Let us help with your problem. If you have a possible application for **MEADMATIC** valves, timers or cylinders, tell us (confidentially) and we'll try to come up with the answer. Write for Air Power Catalog!

Write today for Air Catalog!

MEAD
SPECIALTIES COMPANY

PATHFINDER IN AIR

POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 83

it took 35 seconds and 52 years to process this Diesel engine block

And 52 years? Yes, that's how long Greenlee has been building automatic transfer machines. In these years we have helped solve hundreds of widely diversified problems in automatic production. This experience has won exceptionally wide recognition in the automotive industry. That's why much of our business is repeat business from satisfied customers. If you haven't yet worked with us, now is the time to call. We stay on the job all the way . . . from the time of initial planning until the machine is operating at full efficiency.

PRODUCTION MACHINERY

GREENLEE

- Transfer-Type Processing Machines
- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines
- Trim Presses
- Woodworking Machines and Tools
- Hydraulic and Hand Tools

GREENLEE BROS. & CO. 1909 MASON AVE. ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 84

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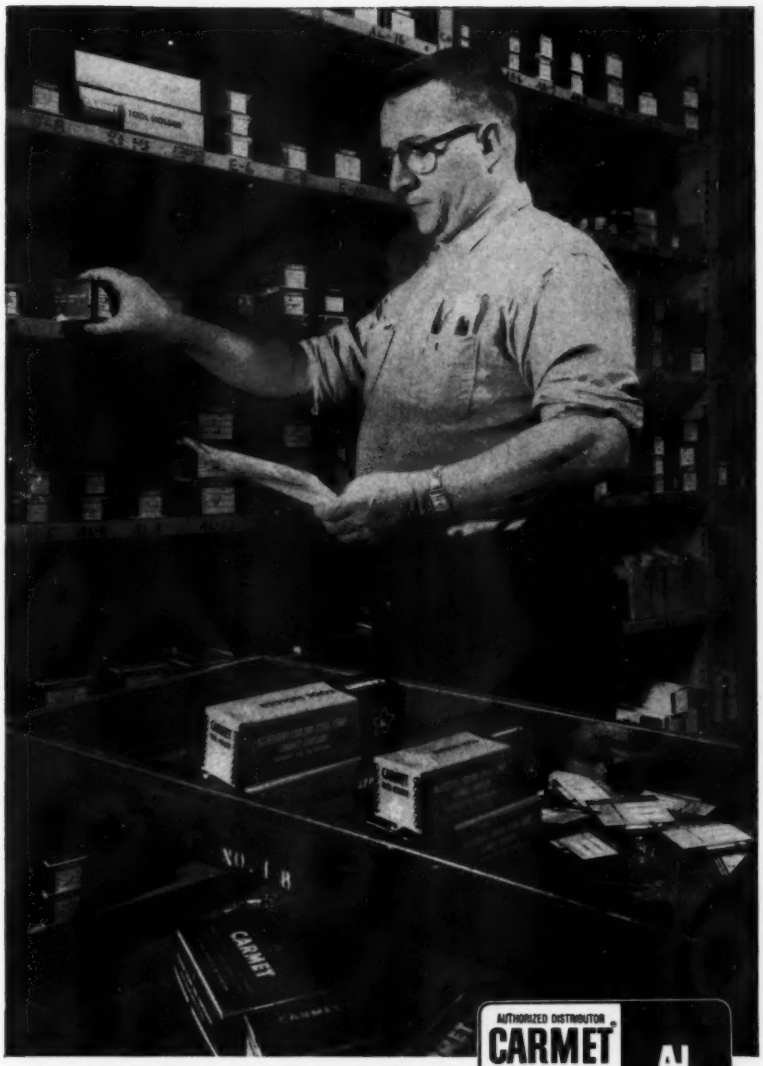

Over 75 distributors, coast to coast, display this sign—service in your own local area.

Keep your inventory of Carmet Carbide Tools at a comfortable level. Keep your working capital free for other needs. Your Carmet distributor carries the load—that's how he's set up to do business.

He carries your needs from the complete line of Carmet Carbide Tools in all grades and every style. He is geared to deliver your orders quickly—a phone call gets action.

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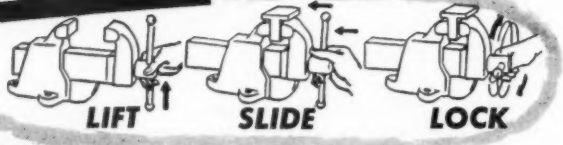
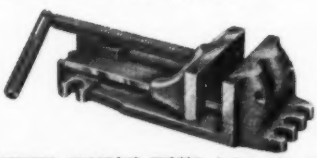
SPEED VISE — the Vise with INSTANT ACTION





MACHINIST'S VISE—Positive locking, fast action—with stationary or swivel base. Choice of three jaw widths: 3½", 4" or 4½". A rugged money-saver, built to last.

PATENTED UNDERCUT THREAD design grips positively when the vise is clamped. Proved in use for 20 years, on the high-production Drill Press SPEEDVISE.

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Buys This Compact Mist Coolant Unit

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Larger Types and Capacities Available

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Overall length 8-1/8"

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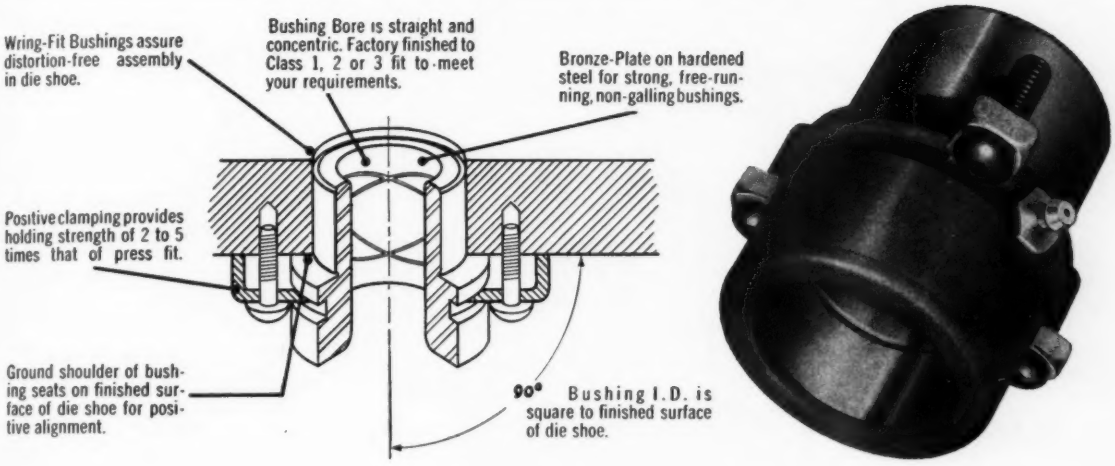
Lower Cost . . . Cut Maintenance . . . Lengthen Die Life

Lamina® BRONZE-PLATED GUIDE PIN BUSHINGS


Wring-Fit Bushings assure distortion-free assembly in die shoe.
Bushing Bore is straight and concentric. Factory finished to Class 1, 2 or 3 fit to meet your requirements.
Bronze-Plate on hardened steel for strong, free-running, non-galling bushings.
Positive clamping provides holding strength of 2 to 5 times that of press fit.
Ground shoulder of bushing seats on finished surface of die shoe for positive alignment.
90° Bushing I.D. is square to finished surface of die shoe.

LAMINA bronze-plated, wring-fit guide pin bushings are honed on the I.D. for accurate geometry, precise dimensions and to provide the best surface finish for lubrication. Bushings are wring-fit in die shoe to assure distortion-free, full-bearing surface that results in better die alignment, less maintenance and longer die life. In addition the Lamina method of clamping bushings to die shoes provides holding strength of two to five times that of press-fit bushings. For more accurate press operation, higher production and lower maintenance costs —standardize on Lamina, the originators of Bronze-Plated Guide Pin Bushings.

Lamina also manufactures: Steel Bushings and Guide Pins, Bronze-Plated Wear Plates, and Bronze-plated Parts. Complete facilities for the manufacture of steel or carbide precision dies (lamination, progressive, transfer, etc.).

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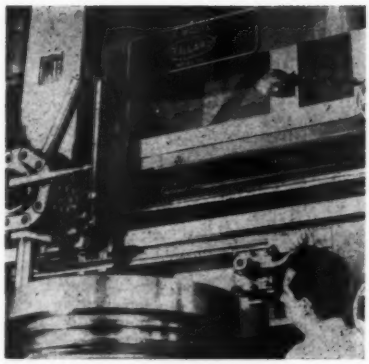
CIRCLE INFORM-A-GRAM KEY NO. 87

Bigger Turret Lathe Boosts Efficiency

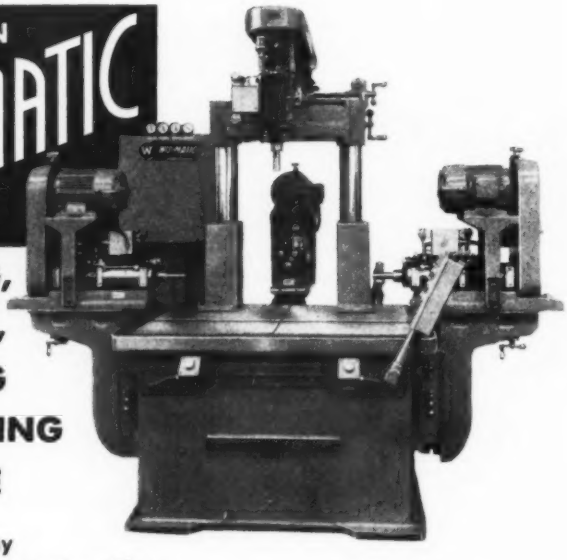
A new turret lathe, which takes cuts simultaneously on both ODs and IDs, has enabled the Philadelphia Gear Corp. to chalk up savings of 20% to 30% in over-all production costs. The 46" Bullard Cutmaster was installed to replace an older one of smaller capacity.



The new machine handles efficiently, and with greater accuracy, such parts as the drum for a gate hoist to be used in a major hydroelectric dam project. The drum contains two helical gears which form its end pieces. These gears are fabricated from carbon steel with a 200 Bhn hardness. The complete drum is 30" high and weighs 4000 lbs.

The lathe machines and faces the gear sections prior to cutting the teeth. OD and ID cuts are made at the same time with a single setup. Cuts of up to ½" at 250 fpm are made and concentricity can easily be maintained to 0.0002".

WISCONSIN WIS-MATIC



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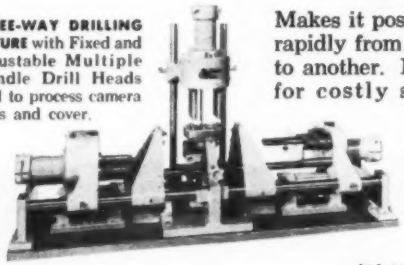
WITH PACKAGE TOOLING



THREE-WAY DRILLING FIXTURE with Fixed and Adjustable Multiple Spindle Drill Heads used to process camera cases and cover.

Makes it possible to change over rapidly from processing one part to another. Eliminates the need for costly special machines. Makes it readily adaptable to a wide variety of production jobs.

Write for Bulletin 560

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CIRCLE INFORM-A-GRAM KEY NO. 88

Rod Cutting Unit Cuts Setup Time

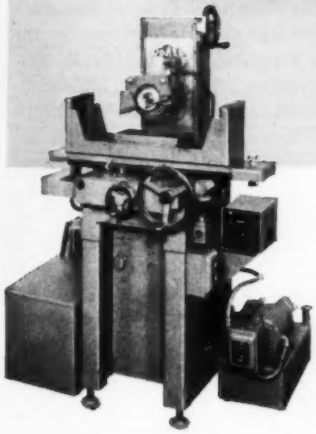
A rate of 2000 cuts/hr on smaller lengths of bar stock is maintained by the Precision Screw Thread Co., with their Di-Acro power rod parter. They use the machine for copper, brass, cold rolled steel and stress proof bar stock up to 5/8" dia in lengths from 5/8" to 36", holding tolerances to 0.115".

The only setup needed for the rod parter is to adjust the length gage for the length of rod desired. The punch press formerly used required a different setup for each different type of rod.

Made by O'Neil-Irwin Manufacturing Co., the rod parter makes smooth cuts so that rods can be threaded immediately without deburring.

FOR BETTER PRODUCTIVITY...

NEW GRINDER FITS JOB and OPERATOR



DoALL DH-612 SURFACE GRINDER
with hydraulic table drive (optional)

Table travel: 7 in. x 13 in.
Work height: 0 in. to 12½ in.
Saddle lock for form and plunge grinding.
Magnetic chucks, permanent and electric types with SELECTRON® rectifier.

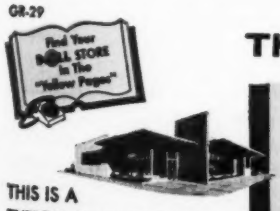
Here is the newest modern, low-cost DoALL surface grinder. It can double on either your tool room work or production runs.

This outstanding grinder offers you the practical combination of both manual and hydraulic worktable movement. It provides convenience and versatility you'll find in no other grinder. Saddle ways support the entire work area. There's no table climb. Operators can grind directly from handwheel calibrations to "tenth" accuracy—with vertical feed calibrated to .0001 in. and cross-feed to .0005 in. Relying upon this accuracy of controls, operators eliminate the old grind-and-measure practice.

The operator can quickly "fit" this grinder to himself. Machine height is adjustable. Table handwheel is easily moved from left to right side of saddle and its position adjusted radially for greatest convenience. These are a few operating features that increase operator productivity.

Complete line of attachments, such as "Cool Grind" coolant system, hydraulic table control and many others, can be purchased with machine or added in your plant. Before you buy any surface grinder, see the model DH-612. Ask your DoALL Sales-Service Store to demonstrate.

GR-29



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5. Light-weight—about 8% lighter than sand-cast bearing bronzes.
6. Resistance to corrosion.
7. Freedom from porosity and sand inclusions.

Ampcoloy 666 is available from stock in convenient mill lengths or cut to your requirements. Write for Bulletin G-53 and name of your Ampco distributor.

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West Coast plant: Burbank, Calif.
Southwest plant: Garland (Dallas County), Texas

CIRCLE INFORM-A-GRAM KEY NO. 90

Book Reviews . . .

HOW TO DESIGN & BUY INVESTMENT CASTINGS. Published by the Investment Casting Institute, 27 E. Monroe St., Chicago 3, Ill., 1959. 176 pages, $3.95.

Aimed at management and technical executives who need authoritative information on investment castings, this book gives a comprehensive insight into the capabilities of this important process. Seven chapters delve into: advantages of the investment casting process, basic production techniques, choice of alloys, vacuum metallurgy, determining quality of cast parts, designing for investment castings, and how to buy investment castings. It includes an appendix guide to investment casting terminology.

THE DIRECTORY OF NEW ENGLAND MANUFACTURERS, published by Geo. D. Hall Co., 20 Kilby St., Boston 9, Mass., 1959 (24th edition). 788 pages, $45.

This directory lists manufacturers of all sizes and types in the New England states—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. An alphabetical section includes company name and address, executive personnel, products manufactured, number of employees, and capital rating. A geographical section lists manufacturers by state and town, and there is a product and a brand name section.

ENGINEERING ECONOMICS FOR PROFESSIONAL ENGINEERS' EXAMINATIONS, by Max Kurtz. Published by McGraw-Hill Book Co., Inc., 327 W. 41st St., New York 36, N. Y., 1959. 260 pages, $6.50.

Packed with formulas and tables, this review text is devoted exclusively to helping engineers prepare for and pass the engineering economics section of the professional engineers' examination. Many exercises and problems, showing typical questions asked in actual P. E. exams throughout the country, with answers or worked-out solutions, prove helpful.

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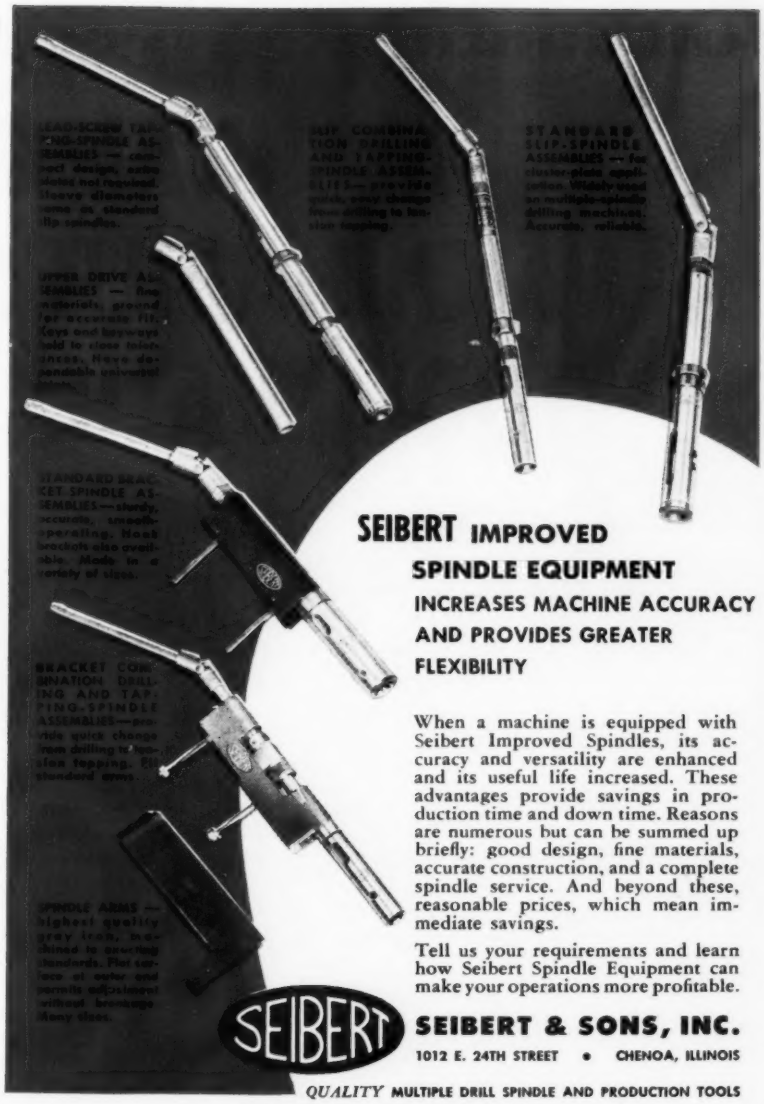

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CIRCLE INFORM-A-GRAM KEY NO. 912

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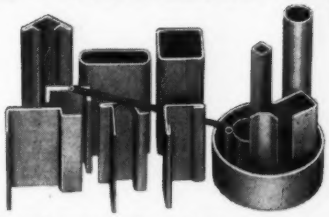
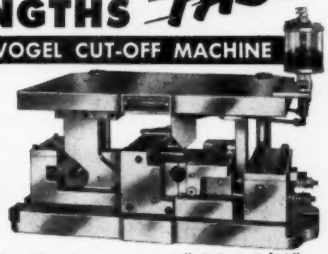
VOGEL CUT-OFF MACHINE





With each press stroke, unit accurately cuts off tubing and shapes into lengths of ½" ±.010", or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

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Odd shapes handled in sizes equivalent to unit's O.D. capacity.

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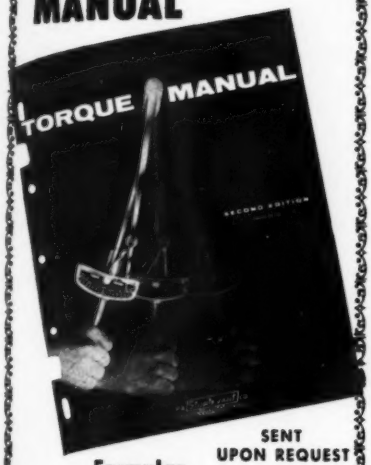

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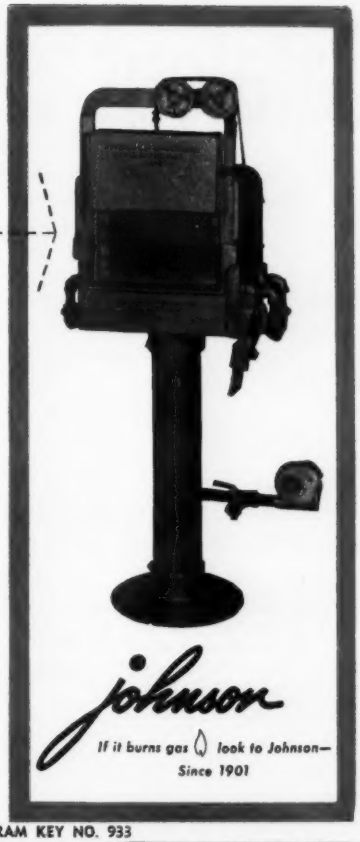

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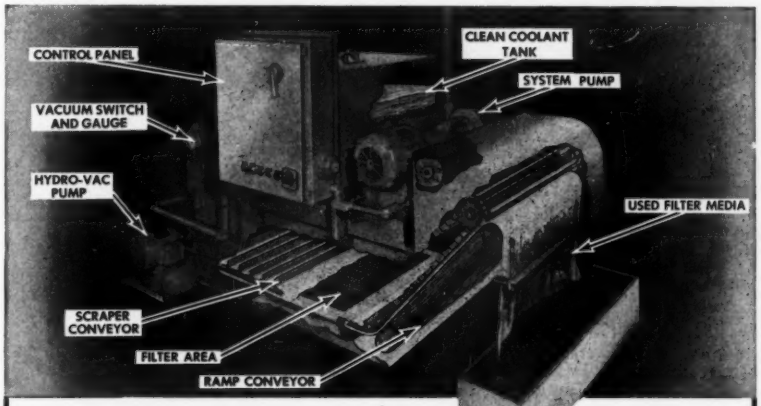

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Catalogs and other helpful literature

An Ultra-High Strength Steel, Unimach UCX2, for propellent chambers and other structural applications in missiles, is completely discussed in a 15-page catalog. Get a copy from Universal Cyclops Steel Corp., or Circle Inform-A-Gram No. C1.

An Engineered Live Center bulletin gives specifications and prices of the standard live centers, which are made with Morse taper, and also includes three types of specials. For details, get Bulletin 160 from Sturdimatic Tool Co., or Circle Inform-A-Gram No. C2.

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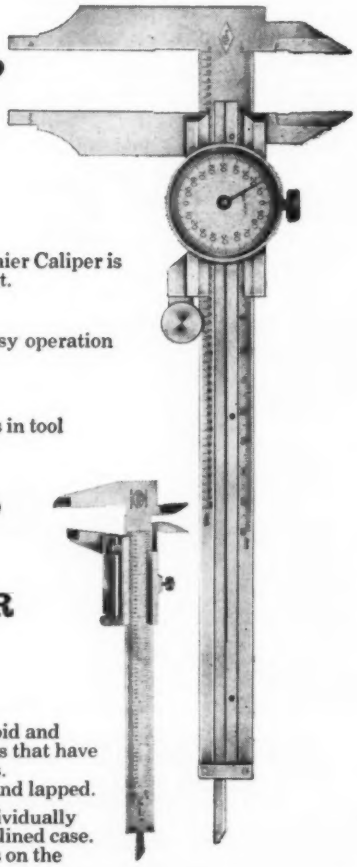

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Practical Ways for Solving dust, dirt, and mist collecting problems with DusKolectors are described in

a new 16-page catalog from Hammond Machinery Builders, Inc. No. DK-820 is filled with photos, cutaways, and specifications. Circle Inform-A-Gram No. C3.

"The Root of the Thread" lists the basic criteria for a good thread tool, compares three widely used thread forms, and presents specifications for a large, round root radius. Also lists areas of usage for improved root radii. Get a copy from Standard Pressed Steel Co., or Circle Inform-A-Gram No. C4.

A New 24-Page Fastener catalog gives details of various tension and featherweight Huckbolt fasteners, self-broaching fasteners, self-sizing fasteners, and pull-thru blind rivets. Request a copy from Huck Mfg. Co., or Circle No. C5.

Inflated Polishing Wheels, expanding polishing wheels, belt sanders, and expanding cones are presented in a catalog. Cost analysis sheets for comparing costs of set-up wheels vs. coated abrasive operations are also available from Nu-Matic Grinders Inc., or Circle Inform-A-Gram No. C6.

Glass Sealing Alloys are treated in a new bulletin describing the properties of three metal-to-glass sealing alloys, and one for sealing into vitreous enamel, available in wire or strip. Driver-Harris Co. will supply a free copy. Circle Inform-A-Gram No. C7.

Catalogs . .

Standard Lines of Carbide throw-away and "on-end" inserts, blanks and brazed single-

point tools are subject of Wesson Co.'s new 36-page Bulletin MF-260. Much valuable technical data is included. For a copy, Circle Inform-A-Gram No. C8.

Straight Thread Ports for Hannifin Series H hydraulic cylinders are covered in a new bulletin. Use its table to determine proper straight thread sizes for 1½" through 8" bore cylinders. Bulletin S-113-1A from Hannifin Co., gives details, or Circle No. C9.

Fast Machining Bar and Tubular Steels are discussed in a bulletin which gives cost cutting speed comparisons, mechanical properties, and case histories. Contact Joseph T. Ryerson & Son., Inc., for Bulletin 12-10, or Circle Inform-A-Gram No. C10.

"Basic Guide to Ferrous Metallurgy," a chart, shows the colors of steels and what it looks like under a microscope at certain temperatures. Definitions of heat treating terms are included. Get a copy from Tempil Corp., or Circle Inform-A-Gram No. C11.

A Flame Spray Process bulletin provides engineering data on spray coatings of metals, ceramics, carbides, and other high melting point materials. Get a copy from Metallizing Engineering Co., Inc., or Circle Inform-A-Gram No. C12.

Three Basic Types of Machinery Mounts are described in a bulletin which tells how they control vibration, simplify and reduce costs of machine installation, and permit easy machine re-location. Contact The Felters Co., Unisorb Div'n, for a copy, or Circle Inform-A-Gram No. C13.

Flexible Hoses used in air and materials handling, dust collection, and fume control are subject of The Flexaust Co.'s new Technical Information Bulletin #92. Data included aims at the problems of selection, performance, and installation. Get a copy by Circling Inform-A-Gram No. C14.

New Hollow Bar Stock sizes are listed in a bulletin which contains tables of standard sizes in round and hexagonal rod and bar, with wall thicknesses, dimensions, and weight/ft. Write Harvey Aluminum for a copy, or Circle Inform-A-Gram No. C15.

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CIRCLE INFORM-A-GRAM KEY NO. 95

Catalogs . .

Standard Carbide cutting tools and special engineering services of Dixie Tool Industries are presented in new Catalog No. 114. Specifications are given on end mills; die-sinking, routing, and keyway cutters; drills, burrs, and file sets; and a new solid carbide bore reamer. For a copy, Circle Inform-A-Gram No. C16.

Welded Products and resistance welders and case histories describing both are in new 24-page Bulletin SP-18 from The Taylor-Winfield Corp. For a copy, Circle Inform-A-Gram No. C17.

A New Broach Catalog covers standard off-the-shelf round, square, hexagon, and serration portable push-type broaches. Write California Broach Co. for a copy, or Circle Inform-A-Gram No. C18.

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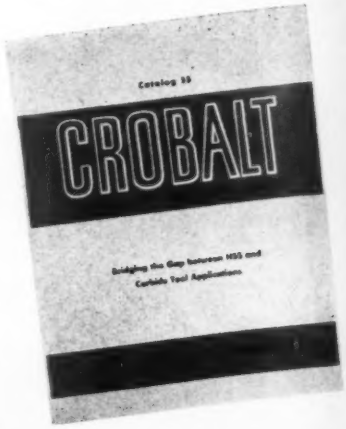
CIRCLE INFORM-A-GRAM KEY NO. 96

A Complete Cast Alloy cutting tool catalog, that explains grades and gives specifications and tool



diagrams, is available from Crobalt, Inc. Included are solid and tipped tool bits, cut-off blades, and specials. For a copy, Circle Inform-A-Gram No. C19.

A New Low-Cost Metal — Hydro-T-Metal, an alloy of zinc, copper, and titanium that features extreme strength, is described in a new bulletin from Whitehead Metals, Inc. Circle Inform-A-Gram No. C20.

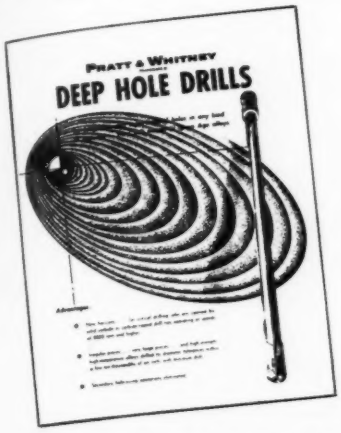
Felt Is a Design Material and The Felters Co.'s new booklet provides information to help engineers specify and apply felt and felt products for a great number of jobs. Circle No. C21.

High Speed Sheeting lines that handle steel stock as thick as 0.020"

and as thin as 0.0055", are subject of Bulletin G-10 from F. J. Littell Machine Co., Automation Div'n. Circle No. C22 for a copy.

Catalogs . .

Deep Hole Drills from Pratt & Whitney Co., Inc., are described in



new Circular No. 638. It includes specifications and a run-down on deep hole drilling history. For a copy, Circle No. C23.

Machinable Stainless Steel-Bonded carbides are described in new Bulletin 60 from Sintercast Div'n of Chromalloy Corp. These Ferro-Tic S compositions give corrosion resistance and strength at high temps. Circle Inform-A-Gram No. C24.

A Machine for Grinding annular forms and grooves in work up to 10" dia and 24" between centers is described in Sheffield's new catalog on the Model 181 Multiform grinding machine. The Crushtrue wheel dressing process is used with it. Circle No. C25.

A chart showing the approximate relation between hardness by various testing systems and tensile strength of carbon and alloy steels is available from Tubular Products Div'n of The Babcock & Wilcox Co. Brinell, Monotron, Vickers, Rockwell, and Scleroscope systems are covered. Circle No. C26.

An Internal Spline Gage, the Comtorplug expanding plug gage, equipped for between-pins gaging of internal splines and gears as quickly and easily as gaging plain round holes, is described in Bulletin #50 from Comtor Co. Circle Inform-A-Gram No. C27.

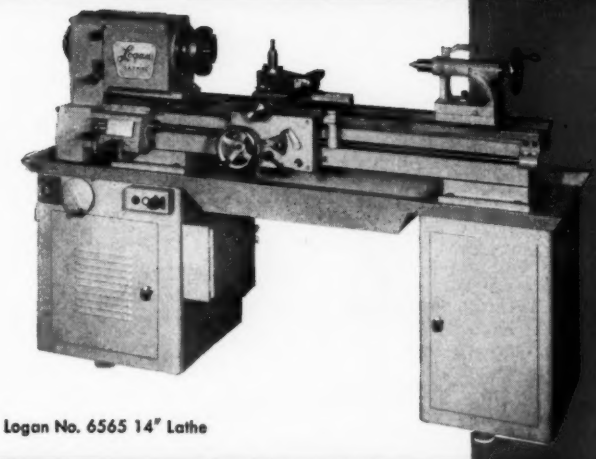
New Hydraulic Tracer Mill catalog from Famco Machine Co. illustrates the versatility of their machines and describes automatic and manual tracers in 1-, 2-, and 3-dimensional models. Circle Inform-A-Gram No. C28.

Diamond Grinding Wheels of both man-made and natural diamonds are described in Simonds Abrasive Co.'s new catalog, Form ESA-310. Grain and grade recommendations, operating data, and illustrations of standard shapes are included. Circle Inform-A-Gram No. C29.

"Around a Part in Just 8 Days" describes how a typical Milwaukee-Matic job was processed from print to finish-machined part in only 8 working days. It compares conventional manufacturing methods with this advanced tape controlled system. Kearney & Trecker Corp. will supply a copy. Circle Inform-A-Gram No. C30.

its specifications add up to high production capacity

Logan 14" Lathe



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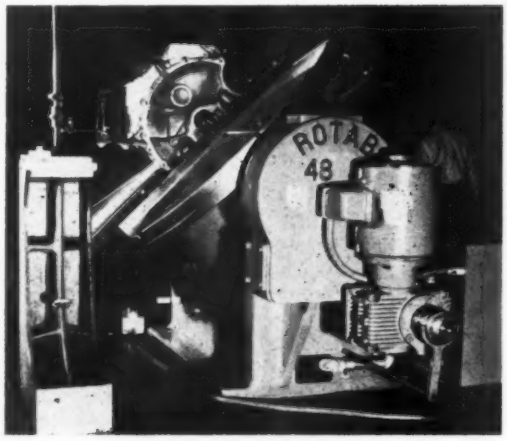
Product News

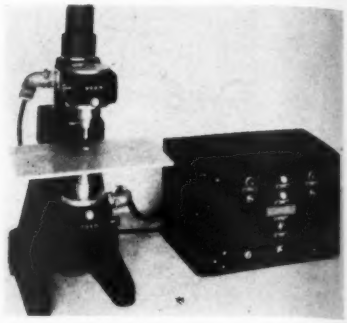
Precision Rotary Table

Basically a universal positioning table, ROTAB offers full 360° radial, full 90° angular positioning with consistent microscopic accuracy within 5 sec of true position. Repeatability of settings within 1 sec of arc are standard procedure. For details, write Machine Products, Detroit, or Circle Inform-A-Gram No. P1.



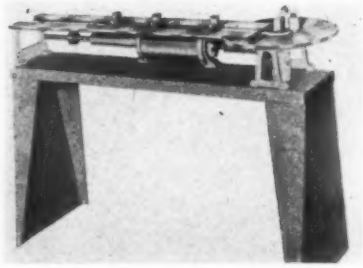
Two-Sided Measuring

This new electronic micrometer is an opposed head measuring device that permits pressureless



measurement from two sides to the centerline of a fragile or compressible part. Measurements to 0.00020″ are automatically displayed on easily read counters. For data on Model VDR, write J. W. Dice Co., Englewood, N.J., or Circle Inform-A-Gram No. P5.

New Power Bender



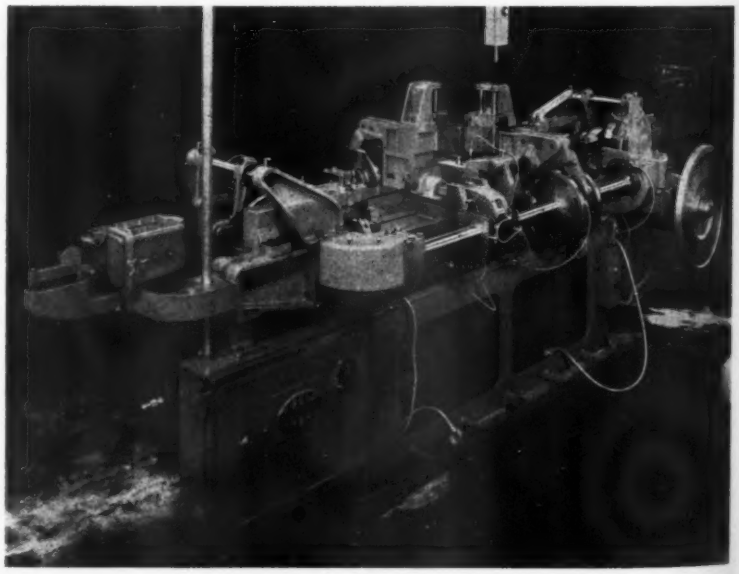
This new B10 Series pneumatic bender handles square, vee, and round shapes, and has a 1/2″ steel capacity. It can be set up in minutes and bending time is less than 1 sec. Write W. V. Industries Div'n, Vemaline Products Co., P. O. Box 222, Hawthorne, N.J., for information, or Circle No. P2.

Chem-Milling Maskant

A new chemical milling maskant protects non-milled stainless steel surfaces. It will resist etchant attack for 8 hrs at 140°F and may be either dipped or sprayed to form a tough, pliable, rubber-like film thickness of 10 to 12 mils. More data on Maskant S51K808 is available from Rinshed-Mason Co., Detroit 10, or Circle No. P4.

Multi-Slide Machine

Stock feeds through either end of the new Duplex Multi-Slide machines so that two stampings can be made at the same time and then assembled in the machine. The dual-feed unit handles coil stock up to 3″ wide and is adjustable for feed lengths up to 6″. For details, write U. S. Tool Co., Inc., Ampere (East Orange), N. J., or Circle Inform-A-Gram No. P6.



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Individual numbers and letters are stamped on all types of identification plates and tags by the new Ident-O-Matic nameplate press. For catalog and details write to Identification Systems Co., 246 Fifth Ave., New York 16, or Circle Inform-A-Gram No. P3.

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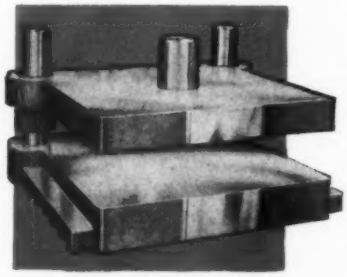

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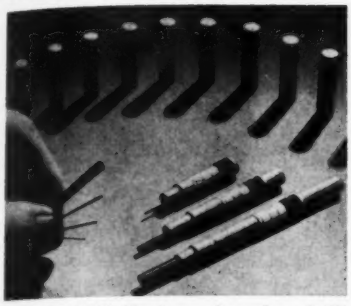
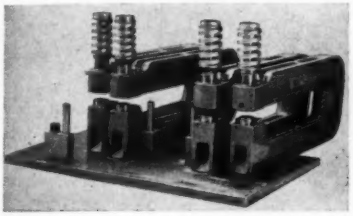
Product News

New Line Drill Blanks



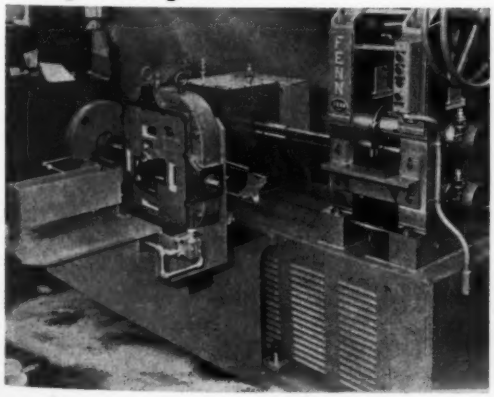
New 1825 Series wire size drill blanks, numbers 1-20, are precision ground from the solid in +0.0000 - 0.0005" tolerances. The complete range of diameters runs from 0.0135" to 0.2280". Get details from Atrax Co., Day St., Newington, Conn., or Circle No. P7.

Self-Oiling Perforator

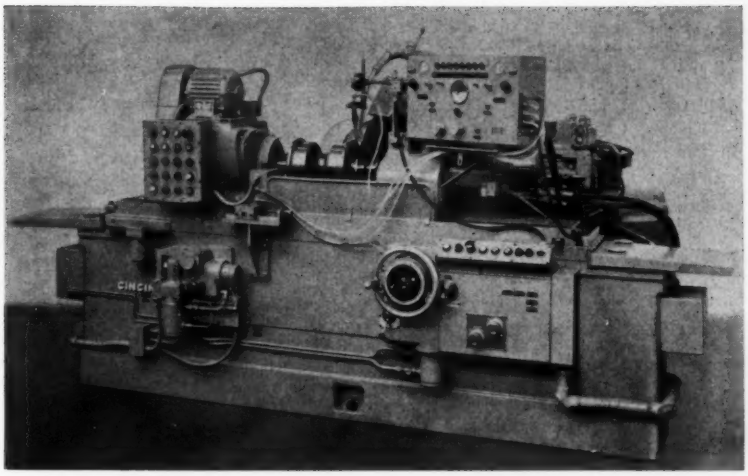


Built-in lubrication is a new feature of the HD series of perforating units made by Tool Products Corp., 377 Old Falls Blvd., North Tonawanda, N. Y. Flow of oil from a small reservoir in the upper holder-arm is controlled by the motion of the punch-guide. Write to the company for catalog No. U-95, or Circle Inform-A-Gram No. P8.

Rolling-Drawing Unit



A new combination unit includes a Model 4-053C two-high-four-high three way precision rolling mill, and a wire drawing attachment for producing various shapes from round wire. The rolling mill and wire drawing attachment are on a common base and are powered by a common drive. For data, write The Fenn Mfg. Co., Fenn Rd., Newington, Conn., or Circle No. P9.



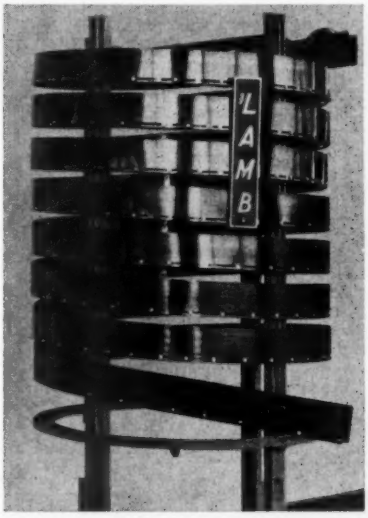
Speedy Grinder

OD and shoulder grinding are combined in a single, fast, automatic cycle on this new angular wheel slide grinding machine from Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Applications include crankshafts, steering knuckles, and gear blanks with hubs. They're built to feed at either 30° or 45° and make it easy to obtain a circular line finish instead of a criss-cross finish. Circle Inform-A-Gram No. P10.

New Paste Material

New epoxy resin based plastic material, Shape, which features ease of mixing and applications, fast curing, dimensional stability and adhesiveness, can be applied with brush or spatula, and curing takes up to 30 min. For data, contact Ren Plastics, Inc., 5422 S. Cedar Rd., Lansing 9, Mich., or Circle Inform-A-Gram No. P11.

Gravity Feed Storage



A new helical part storage and lowering unit provides a gravity flow bank of parts at the machine input in automatic or manual parts handling installations. Floor type and suspended models are available; minimum size is 10" dia. Get details from F. Jos. Lamb Co., 5663 E. 9-Mile Rd., Detroit 34, or Circle Inform-A-Gram No. P12.

KELLER
Die Filers
Deluxe $149.50
3 MODELS
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STANDARD — Has file roller support, with motor, $131.50
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MINIATURE
DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths 1/4" to 3"
.0002 Tolerance on I.D.
O.D., and Concentricity
Specials to your specifications
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CHROMELLOY
Chromelloy quickly hardens any steel, even cold rolled, by a carburizing, nitriding and alloying effect. Mild steel tools or parts, Chromelloy treated, will outlast by several times same items made of tool steel and hardened in usual way. Easy and safe to use—no cyanide. Used over ten years by largest plants.
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CIRCLE INFORM-A-GRAM KEY NO. 1025

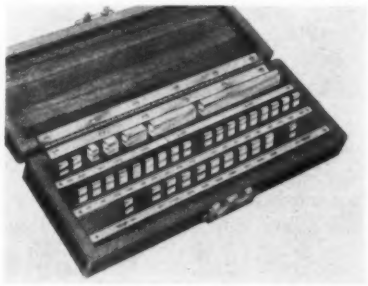
Product News

Air-to-Oil Booster

This new S-P air-to-oil booster has an integrally mounted tank designed to boost ordinary compressed air from 80 psi to 3000 psi hydraulic pressure. Its simple, compact design saves space and permits its use for powering such equipment as spot welders, work-holding fixtures, and bench or arbor presses. Contact The S-P Mfg. Corp., 30201 Aurora Rd., Cleveland 39, or Circle Inform-A-Gram No. P13.

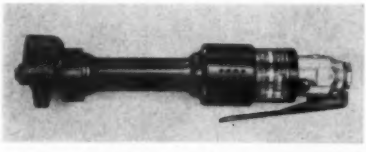
Gage Block Set

Specially designed for smaller shops, this new gage block set contains 36 blocks of the most widely used sizes. They're low in cost and yet have inspection accuracy of +0.000004", —0.000002". Write the Webber Gage Co., 12900 Triskett Rd., Cleveland, 11, or Circle Inform-A-Gram No. P14.



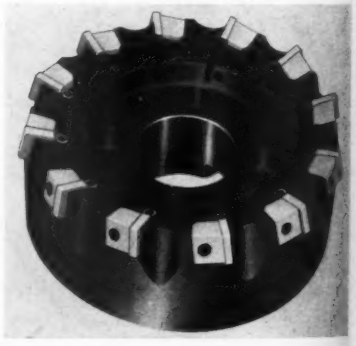
Small Grinder

Small, lightweight, air-operated horizontal grinders for die and deep hole work may be adapted for use with rotary files, cutters, and midget mills. The 40-oz 31G-520 grinder is only 10" long, operates at 20,000 rpm. For details, write Buckeye Tools Corp., 5003 Springboro Pike, Dayton 1, Ohio, or Circle Inform-A-Gram No. P15.



Milling Cutter

The new Kendex milling cutter eliminates expensive cutter grinding and blade resetting. Standard Kendex throwaway inserts are held by thick wedges that provide positive seating. Double-end screws lock in and release the inserts quickly. Write Kennametal Inc., Latrobe, Pa., or Circle Inform-A-Gram No. P16.



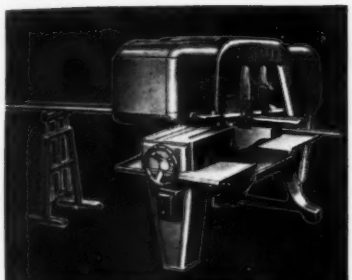
JOHNSON MODEL J . . . A big, rugged saw that cuts anything — anywhere! 10" rounds, 18" flats, heavy structurals and odd shapes. Available in wet or dry cutting models, variable speed drive and optional equipment.

JOHNSON MODEL B . . . Also available in wet or dry, metal cutting models, variable speed drive. Will easily handle 5" rounds, 10" flats, odd and irregular shapes.

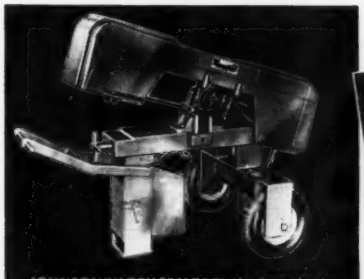
Only Johnson offers *all* of the outstanding construction features and performance advantages — *at a lower initial price.*

Why pay more when you can have the best for less? Compare Johnson saws with others costing hundreds more, and you'll find that *only* Johnson delivers the life-long, maintenance-free efficiency you've always wanted.

Immediately available in five high capacity models to meet any metal cutting requirement — efficiently and economically.



JOHNSON ADJUSTABLE STOCK STAND . . . A necessity for operational safety and production efficiency. Solidly built, easily adjusted even under load. Practical and inexpensive.



JOHNSON "MOBILE" MODEL M . . . Same husky capacity as Model B, but wheel-mounted for fast, easy maneuverability indoors or out. Has self-contained handle, power line, tool box and accessories.

Write Today . . . for your copy of the big, new Johnson catalog. Illustrates and describes all models and accessories.

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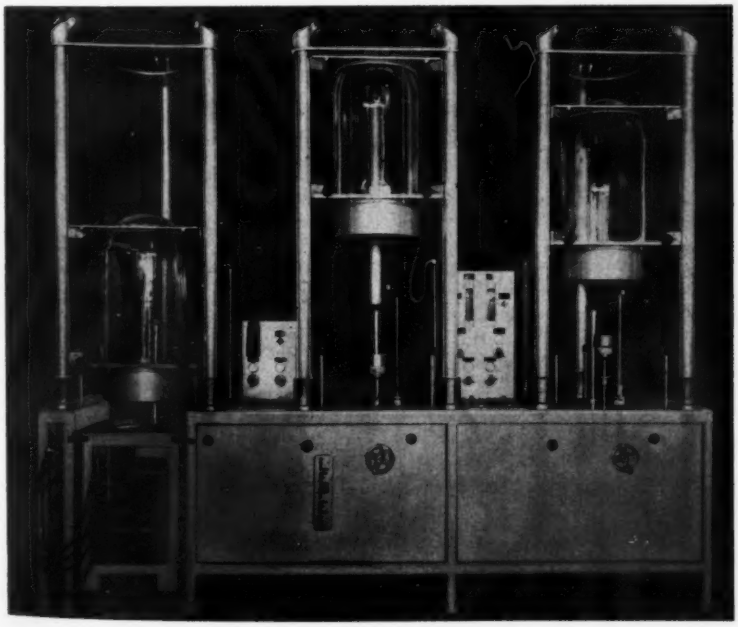
1605 Solano Avenue
Berkeley, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 103

Brazing Fixtures

Bell jar fixtures for controlled atmosphere fluxless induction brazing are combined for speedy production in a new unit made by Lepel High Frequency Laboratories, Inc., 55th St., and 37th Ave., Woodside, N. Y. One of the three heating stations can be detached, rolled out, and replaced for rapid job changeover. Circle No. P17.



Metal Paste

Lab-Metal is a tough, versatile metal which adheres permanently to metal, wood, plaster, glass, or plastic. Applied as paste right from the can it withstands heat up to 350°F and, when hard, it can be milled, drilled, tapped, or ground. It can be thinned for brush or spray applications. Get details from Alvin Products, Inc., 20-22 Houghton St., Worcester 4, Mass., or Circle Inform-A-Gram No. P18.

TOOLING IDEAS FOR DRILLING

Stubbing drills in preset holders increases productivity

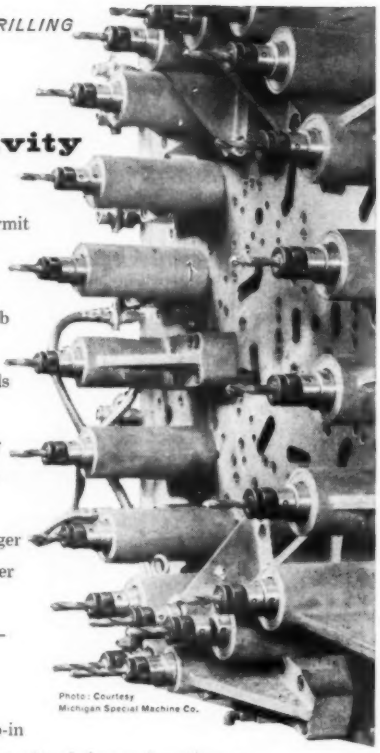


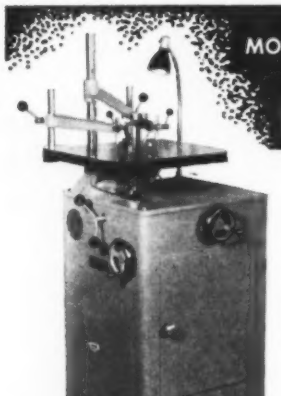
Photo: Courtesy Michigan Special Machine Co.

SCULLY JONES "Stub-A-Long" chucks on this multiple-spindle drilling head permit setting tools accurately outside the machine. They avoid hours of downtime for routine adjustments. A simple height gage does the job for a lot less money. But this is only one way they reduce costs. Note how the tools are stubbed up in the holders. Long drills are like torsion springs, with torsional twist or vibration on the cutting edges proportional to projection. Stubbing makes them stiffer—reduces chatter and saves drills. Result is longer tool life, increased production. Add still another advantage. Short rigid drills cut straight without bushings. This eliminates "rubbing"—a cause of drill wear overlooked by many people. "Stub-A-Long" chucks are available with quick-ball-lock collars, the snap-in holders that eliminate 80% of tool-change downtime on multiple-spindle machines. Your Scully-Jones representative or distributor can show you other tooling ideas that increase machine utilization. Phone him or write for literature.

MAXIMUM MACHINE UTILIZATION

Scully-Jones and Company 1913 S. Rockwell St., Chicago 8, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1041



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The Complete Low-Cost Answer to Your Larger Die-Making Problems

- ★ Tilting Power Ram Permits Working from *Level* Table
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- ★ 20" square table — Special table available in 24" x 28" size

Send for PDM Bulletin, also Bulletins on Rice — Milwaukee Complete line of bench type Die Filers and Profile Grinders.

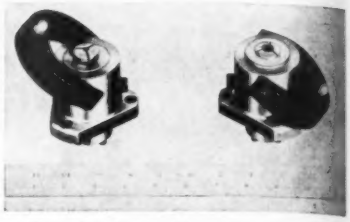
RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1042

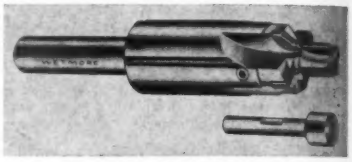
Product News

Fixtures Save Space



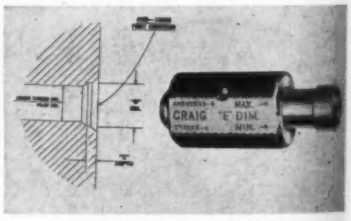
Standard, small press, chucking, milling, tapping, and other machines can be tooled easily and inexpensively with a new line of collet-holding turn-table fixtures made by Zagar, Inc., 23894 Lakeland Blvd., Cleveland 23. Their small size allows close grouping of several fixtures on small index tables. Circle No. P19.

Dual Tool



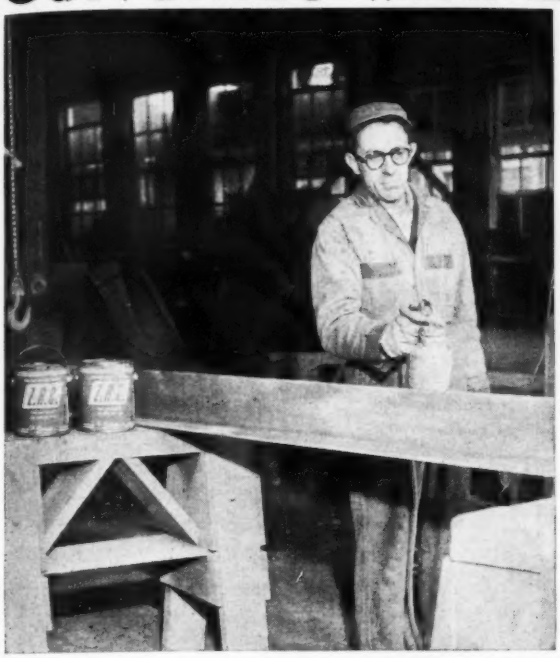
New carbide tipped port contour cutters for AND 10050 standard hydraulic fittings are made in sizes from 1/8" to 2" tubing OD. The dual purpose cutters have a removable tap hole reamer that may be replaced with an optional end pilot. Write Wetmore Tool & Engineering Co., 5320 E. Washington Blvd., Los Angeles 22, or Circle Inform-A-Gram No. P20.

Port Contour Inspection



A combination flush pin and go-no go gage is specially made to check the critical O-ring seat on hydraulic port contours made according to military specifications AND 10050. The easy-to-use hardened alloy steel gage comes in 13 sizes. Get details from Craig Tools, Inc., 133 Lomita St., El Segundo, Calif., or Circle No. P21.

Galvanize with Z.R.C.®



to stop RUST and RUST CREEPAGE

apply by brush, spray or dip!

Z.R.C. provides instant, long lasting galvanic protection for all iron and steel surfaces.

It's ready for use right from the container, requires no special surface preparation, mixing or blending, and dries quickly (touch dry in 30 minutes) to form a tough, flexible, firmly adherent coating of 95% zinc. THIS COATING ALONE WILL WITHSTAND OVER 3000 HOURS OF SALT SPRAY TESTING AND PASSES THE PREECE TEST. It may be top coated if decorative painting is necessary. Cost, about 2¢ per sq. ft.

Production—Z.R.C. galvanizing eliminates handling and shipping costs, speeds operations. Maintenance—Z.R.C. sharply reduces annual labor costs. For full details . . . .

the SEALUBE company

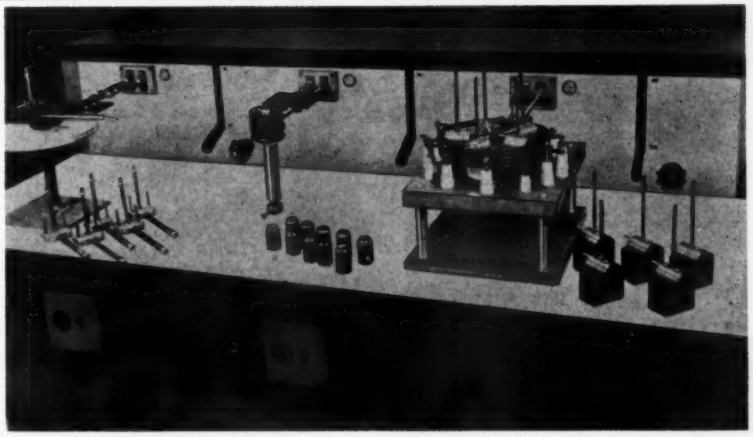
WAKEFIELD, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 105

Mist Remover

Costs are cut and working conditions improved with the Misti-Maze electronic mist precipitator.

The easy-to-install, self-contained unit removes oil, mist, smoke, and fumes from shop air and recirculates the cleaned air. The Air-Maze Corp., 25000 Miles Rd., Cleveland 28, or Circle No. P22.



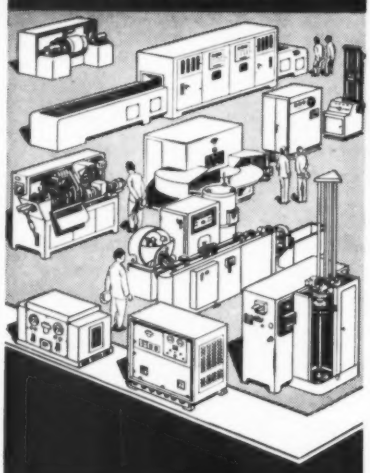
Induction Heating Unit

A single induction heating generator powers this three-position work table which is ideal for production soldering, brazing, and heat treating. Each station can be operated by a pushbutton, footswitch, or timer. Write Lepel High Frequency Laboratories, Inc., 55th St. and 37th Ave., Woodside, N. Y., or Circle Inform-A-Gram No. P23.

Pre-Colored and Oversize

"Scribe-It" is Marshall Steel's new pre-colored and oversize ground flat steel. It's available in 18" and 36" lengths, and can be heat treated and then finish ground to nominal size. For details and prices, write Marshall Steel Co., Box 108-TP, LaGrange, Ill., or Circle Inform-A-Gram No. P24.

for HARDENING • BRAZING
SOLDERING • FORGING • ANNEALING
MELTING • SINTERING • WELDING
REFINING • SHRINK FITTING
CRYSTAL GROWING



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Manufactures the most complete range of

INDUCTION HEATING EQUIPMENT

ELECTRONIC • LOW FREQUENCY
MOTOR GENERATOR

THER-MONIC features

• Over 20 years of concentrated experience.

• Over 5,000 installations.

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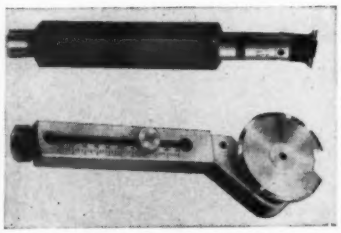
DO YOU HAVE UNSOLVED TESTING PROBLEMS ????

They can be solved. We design and build special testing machines to fit the most peculiar requirements.

Tell us about yours.

DETROIT TESTING MACHINE COMPANY
9386 Grinnell Avenue, Detroit 13, Michigan
CIRCLE INFORM-A-GRAM KEY NO. 1062

THREAD Cutting Tool



Provided with a scale for angular setting.

Circular Cutter, in high speed or carbide, has a negative profile and machines both thread flanks simultaneously. Thread cutting discs for all threads are available for both external and internal tool holders.

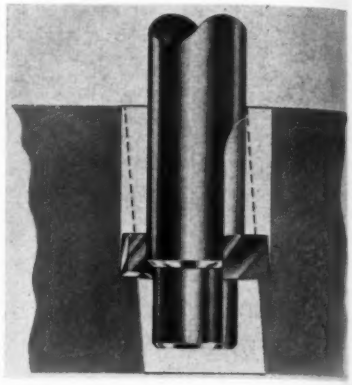
ACME TOOL CORP.
71 West Broadway,
New York 7, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1063

Product News

Core Drift Corrector

Core drift is eliminated when cored holes are bored with a new line of adjustable Core-Rector cut-



ters. They have a special grind to eliminate the deflection normally encountered in machining off-center cored holes by conventional methods. For details, write Muskegon Tool Industries, Inc., 11th at Western, Muskegon, Mich., or Circle Inform-A-Gram No. P25.

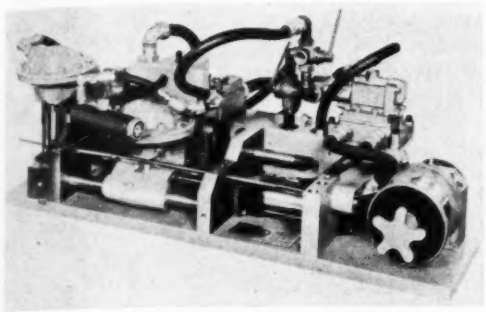
Two-Way Valve

This roller-operated #121 2-way hydraulic valve features a lapped poppet and seat assembly to prevent leakage in the closed position.

Maximum allowable pressure is 1500 psi at the "in" port and 500 psi at the "out" port. Contact Barworth, Inc., 681 Morris Turnpike, Springfield, N. J., or Circle Inform-A-Gram No. P26.

Product News

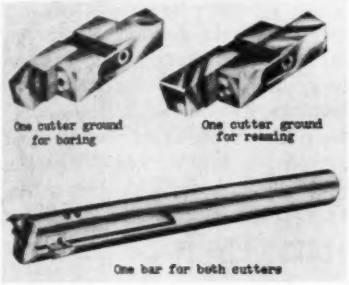
New Cut-Off Unit



This automatic wire feed and cut-off unit accurately measures, feeds, and cuts off wire with an accuracy of 0.002", in 1" to 6" increments. Models for wire sizes up to 3/16", and stroke lengths from 1" to 24" are also available. Contact Special Engineering Service, Inc., 7630 Wyoming, Dearborn, Mich., for details, or Circle Inform-A-Gram No. P29.

Short Run Tooling

Setup time and tool inventory are reduced with this new Short Run Tool Kit for limited boring and reaming operations. It consists of a single bar and two adjustable cutters, one for boring and one for reaming, which can be interchanged without disturbing the bar setup. Get prices and details from Muskegon Tool Industries, Inc., 11th at Western, Muskegon, Mich., or Circle Inform-A-Gram No. P27.



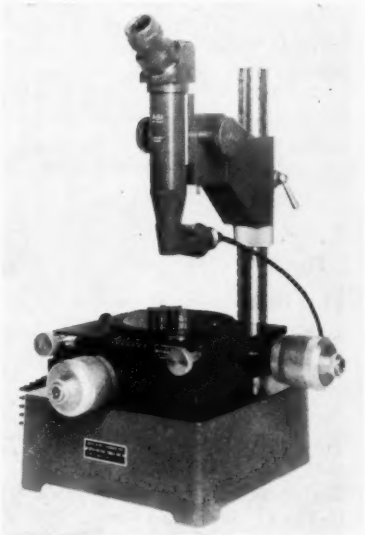
Micrometer Head

This 2" range micrometer head readily attaches to special gages and fixtures, machine tools, and other equipment where micrometer accuracy is required. Markings on the hub read from left to right, with the spindle receding into the head as the reading increases. For details write The Lufkin Rule Co., Saginaw, Mich., or Circle Inform-A-Gram No. P28.

New Dust Fans

Cast aluminum fans are now offered as standard equipment on Model 500, 800, and 1100 series Dustkop dust collectors. The lightweight, spark-proof fans improve the suction efficiency of the units. For details, write the Aget Mfg. Co., 1384 Church St., Adrian, Mich., or Circle No. P30.

New Microscope



The new model of the Leitz Simplex toolmaker microscope is designed especially for measurement of coordinates. Polar coordinates can be read directly from its 360° rotary stage. Total range is 2" x 2", with direct micrometer readings in 0.0001". Ask for circular No. 81/155 from Opto-Metric Tools, Inc., 137 Varick St., New York 13, or Circle No. P31.

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LARGEST STOCK OF
SPECIAL RH & LH Taps-Dies & Thread Plug Gages
Also in Stock:
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• SPECIAL REAMERS
• EX. LONG DRILLS
Write Today for WALL CHART Special Taps Also Made to Your Print Specifications
Quotations on Request
FIELD TOOL SUPPLY CO.
Industrial Cutting Tools
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All Phones: FInancial 6-1195
CIRCLE INFORM-A-GRAM KEY NO. 1071

Every Shop Should Own One
13.50
No distortion — even on 1/8" stock!
MODEL "C"
KNURLMASTER
Hand Knurler
For small production runs on 1/8" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard 1/2" dia. Forged steel frame is self-centering. Write for illustrated folder.
ROCKWIN MANUFACTURING CO.
80A MAGNOLIA AVE., WESTBURY, L.I., N.Y.
CIRCLE INFORM-A-GRAM KEY NO. 1072

Since 1954, The Original
Advance.
CROSS SLIDE ROTARY TABLE
Has been cutting set-up time costs, improving precision in hundreds of DIE, MOLD and TOOL SHOPS. A profitable investment for your shop . . . investigate today.
Built Only by
ADVANCE PRODUCTS CORP.
BENTON HARBOR, MICHIGAN
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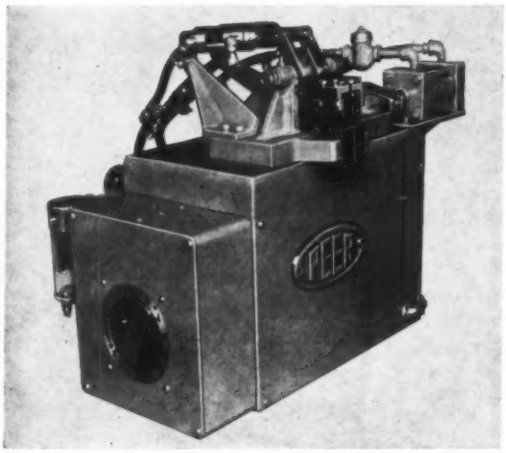
Product News



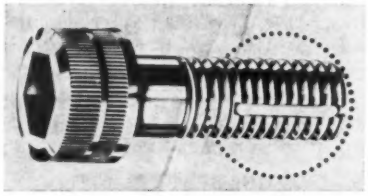
Butt Weld Unit

High production precision butt welding is possible with the new Model B10 automatic air-operated unit made by Peer, Inc., 1200 Milton St., Benton Harbor, Mich. Precision alignment is maintained by air-operated clamping jaws and anti-friction slides. Special features make it easy to set up and operate. Contact the company for details, or Circle No. P34.

Ring for Tough Jobs

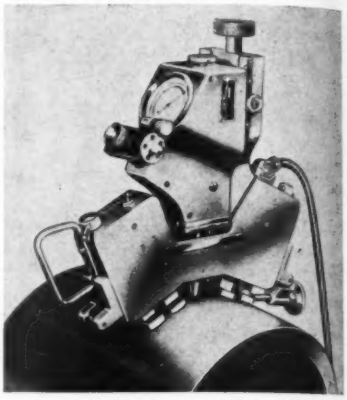
This new Teflon-impregnated asbestos cloth packing may be used on all hydraulic and pneumatic equipment using V-type packing rings. It's ideal for operating conditions involving high temperatures, lack of lubrication, excessive pressures and speeds, and chemical attack. Get data on the R/M No. 1250 "Vee-Flex" packing rings from Raybestos-Manhattan, Inc., Passaic, N.J., or Circle Inform-A-Gram No. P32.

Socket Screw Inserts



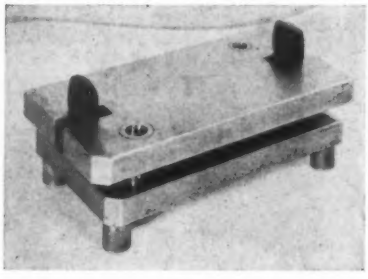
Self-locking plastic inserts on a new line of P-K socket screws provide high shock and vibration resistance over a wide range of temperatures. The non-protruding Long-Lok inserts pass easily through normal clearance holes. Get data and samples from Parker-Kalon Div'n, General American Transportation Corp., Clifton, N.J., or Circle Inform-A-Gram No. P36.

Hardness Tester



Portable Penetrascope hardness tester is held on curved or flat parts with an adjustable electromagnetic clamp. A manually controlled hydraulic unit applies loads up to 30 kg to the diamond pyramid indentor. For data, write Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38, or Circle Inform-A-Gram No. P37.

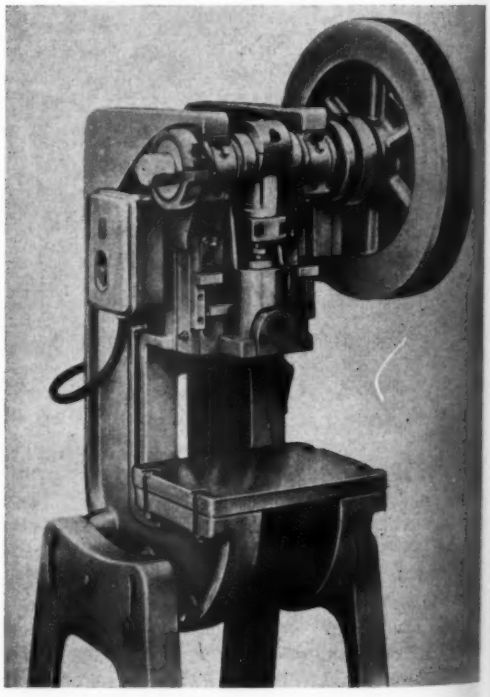
Cost Saving Sandwich Jig



Design and production costs are cut by users of these standard sandwich jigs. They can be quickly and easily adapted to nearly every type of fixture need. Seven sizes are available. Get details from Smith Engineering & Tool Co., Box 94, Glen Ridge, N.J., or Circle Inform-A-Gram No. P33.

18-Ton OBI Press

Higher speed and greater safety are features of a new series of 18-ton OBI presses introduced by Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22. Standard models include Electro-Safe, standard slow speed, variable speed, and deep throat types. Optional extras, including a special safety clutch, are available. For full details, Circle No. P35.



91

AIR-MITE

PRODUCTION AIR PRESSES

- Any length column
- Any length stroke
- ¼, ½, ¾, 1 Ton capacities
- Special adaptations available

ONE MANUFACTURING SOURCE FOR PNEUMATIC AUTOMATION COMPONENTS

- Cylinders
- Presses
- Valves
- Filters
- Regulators
- Lubricators
- Fittings
- Hose

Air-Mite Production Air Presses are ruggedly built for high production applications. Solid steel column for greater strength and rigidity; compact, powerful cylinders have long, maintenance-free construction features that insure uninterrupted service. Available with a variety of controls for fast, safe operation. Press shown is equipped with two Air-Mite 3-way valves — 1 normally "closed", 1 normally "open." Cylinder will not return for second stroke unless both valves are released.

Write for complete Air-Mite catalog which illustrates and describes the Air-Mite line.

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4405 AW Kinzie St., Chicago 24, Ill.

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The Most Complete Line of—

IMPREGNATED MOUNTED DIAMOND WHEELS

(Resin and Al-Aloid Bond)

AVAILABLE ANYWHERE

For—

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• FORM GRINDING ON CARBIDES, CERAMICS OR HARD STEELS

Also ideal for electro-assist and electrolytic grinding. A higher quality at lower cost. Over 3000 different shapes and sizes available. Diamond sizes from 46-mesh to 6400-mesh, man made or natural diamonds at same cost.

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A.I.T. Diamond Tool co.

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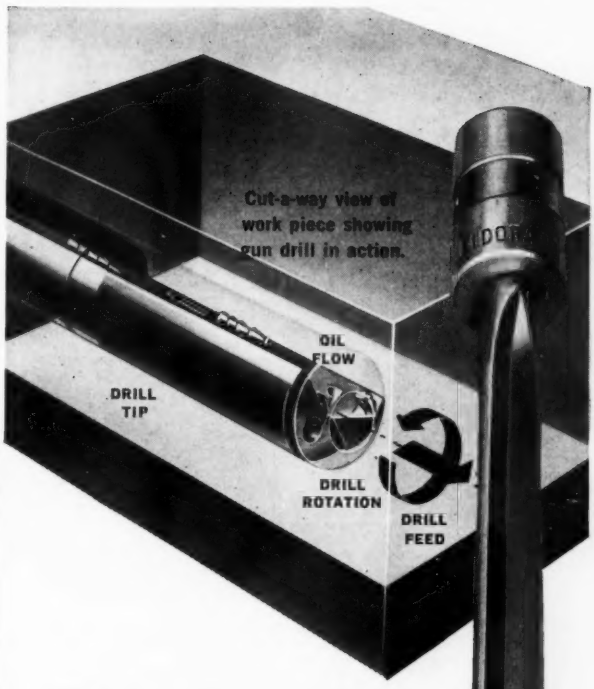

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DRILL HOLES

more economically... more efficiently, with controlled surface finish.

Drill straight, round, accurately finished holes at high speeds... through solids, blow-holes, hard spots and across-holes, in one single operation.

If you are now using gun drills, it will pay to find out how ELDORADO can cut your costs, give you improved hole finish. Chances are there's an ELDORADO Gun Drill in stock for you. Avail yourself of ELDORADO's experience and research facilities to answer your 'hole' problem.

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MADE TO YOUR SPECIFICATIONS:		AVAILABLE FROM STOCK:	
Sizes	.1250" to 2" dia.	1/16" to ½" dia. in 64ths	½" to ¾" dia. in 32nds
OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2¾" long	1" dia. x 2¾" long
Tips	Carbide	Carbide	Carbide

Now, order from stock, or send in your specifications for a prompt quotation.

Specializing 100% in Gun Drills and Related Tools.

ELDORADO TOOL & mfg. corp.
*Trade Mark
358 Boston Post Road • Milford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1093

A Specialized Pipe, Stud, and Screw Extractor, *that will stop small Cost Leaks in Metalworking*

How much time do you waste removing broken pipes, studs, and screws? Does expensive machinery get damaged by makeshift methods? Much of this wasted time, and damage can be prevented by "Reps" Extractors.

The "Reps" Extractor makes a powerful, four-point, pulling bite without reaming. Its hardened steel will remove any material. Furnished in sizes for every nine 1/8" to 2", every stud and screw 3/8" to 3-1/2".

Here is a typical "Reps" extractor in action, removing a broken boiler connection. Below is the extractor and the broken pipe after easy removal. One of many uses throughout industry.

"Reps" are a maintenance necessity in Steel Mills, Machine Shops, Railroad Yards, Ship Yards, Ice Plants, Garages, Hospitals, Breweries, Chemical Plants, and Oil Production and Refining. Try them at our expense. Free trial offer.

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THE WALTON CO. HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1101

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ON WORK HOLDING TOOLS FOR PRODUCTION, TOOLING, MAINTENANCE

Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises, and adjustable angle plates are illustrated and fully described in the New Palmgren Catalog. This is the only complete line of work holding devices available anywhere. Designed for production, tooling, and maintenance work, there are 68 different models and types to choose from. Vise jaw sizes are from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today. The complete line with details and prices are shown.

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Right Angle Attachment
No. 4208M
SUPER PRECISION
MILLING SPINDLES
By STANDARD
No. 6026M Motorized, Liquid or Fan Cooled; with Feed
No. OOMY with Built-in Feed
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No. 4250M2Y Infinitely Variable 100 to 1000 R. P. M.

Specify rugged, dependable Standard Super Precision Milling Spindles. The nation's widest line of conventional designs plus custom engineering service.

"endless versatile variations"

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the STANDARD electrical tool co.

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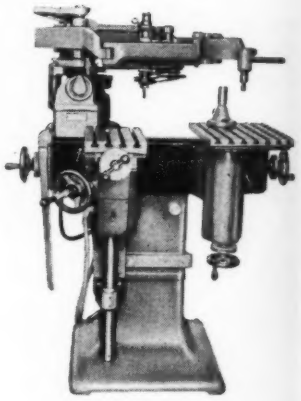
The Machine Tool Exposition Chicago Sept. 6-16 Booth 1450

CIRCLE INFORM-A-GRAM KEY NO. 1103

ALEXANDER DIE-SINKERS

for 2 or 3 dimensional work

Latest model, No. 3, for molds and dies up to 1000 lbs. Ratios from 1.5:1 to 10:1, 14 spindle speeds from 475 to 9500 rpm, cutters up to ⅜" dia. Air blower removes chips.



Two smaller sizes, 1A and 2.

Prompt delivery. Spare parts are stocked in Caldwell.

Get a close look at Alexander engravers and die-sinkers —optical dividing head, centering and cutter grinder microscopes, cylinder roller attachments and other accessories. Write for catalog.

J. ARTHUR DEAKIN, INC.

31 ROSELAND AVE. CALDWELL, N. J.

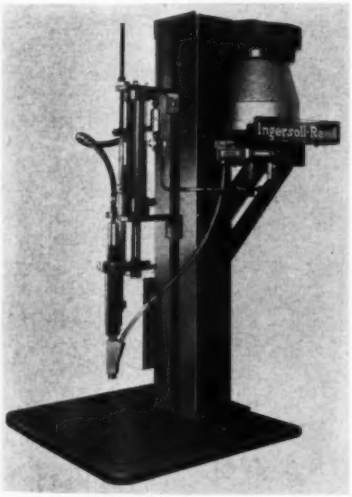
CIRCLE INFORM-A-GRAM KEY NO. 1104

Product News

Adjustable Chipbreaker Toolholders

The new Dial-A-Breaker Kendex toolholder permits fine adjustment of the chipbreaker and close control of chips. A knurled adjusting nut on top of the toolholder provides an infinite number of chipbreaker positions. Get details from Kennametal Inc., Latrobe, Pa., or Circle Inform-A-Gram No. P38.

Automatic Screw Driver



Screw patterns can be quickly changed on the new R-A-F screw driver by loosening and tightening only two bolts per powerhead. It has three different power ranges for precise predetermined torque control. The powerhead stroke is adjustable up to 6". Ask for Form 5266 from Ingersoll-Rand Co., 11 Broadway, New York 4, or Circle Inform-A-Gram No. P39.

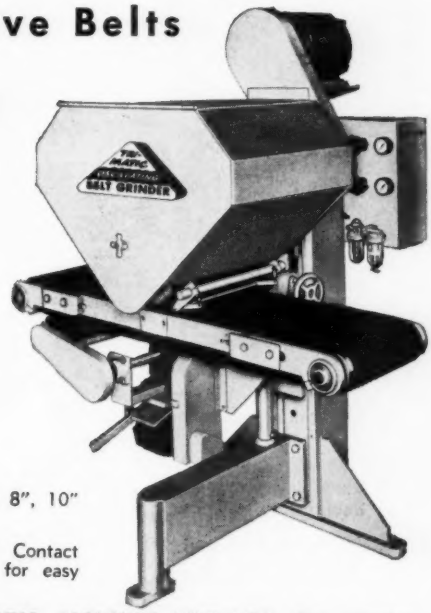
NEW TRI-MATIC Oscillating Belt Grinder

deburrs, descales, grinds, polishes . . .

Change Abrasive Belts

IN LESS THAN

2 MINUTES



BELT TRACKING adjustments are completely eliminated. No projecting belt guides interfere with sliding one belt off and another on. It takes less than 2 minutes from turning off the machine to re-starting.

4 MACHINE SIZES IN 1 A simple adjustment permits use of 6", 8", 10" or 12" wide belts.

EASY CHANGE CONTACT WHEELS Contact wheel and mount are one unit for easy changing.

OSCILLATING BELT SPEEDS GRINDING, PROLONGS BELT LIFE The shearing action of the abrasive belt makes it cut faster, clean itself better, reduces grinding pattern to a minimum and makes belts last longer. Variable speed conveyor adds to versatility. AVAILABLE in 12", 18", 24" and 30" models.

Write TODAY for illustrated descriptive Bulletin TM-459.

TRI-MATIC DIVISION

Send problem parts to our abrasive engineers for processing and suggested solutions. No obligation.

Sales Service Mfg. Co.

2361 University Avenue, St. Paul 14C, Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 1111

PRECISION SHAPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS

Range: 3/8" to 3" for concave radii on lathes. Two sizes for convex radii (Balls up to 2½" dia.) on lathes. Also heavy duty model for radii to 6" on planers, etc.

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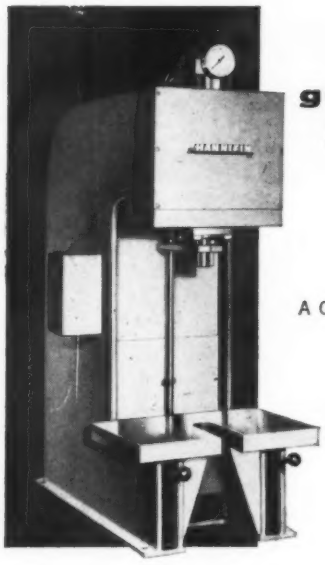
Patent Pending

C. B. TEETER - Tool Room Specialties

3443 N. Greenview Ave., Chicago 13, Illinois • Phone DRexel 3-3571

CIRCLE INFORM-A-GRAM KEY NO. 1112



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at lower cost with
HANNIFIN
"FD" PRESSES

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A COMPLETELY NEW LINE OF HIGH-SPEED HYDRAULIC BENCH PRESSES

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FAST DELIVERY—ALL THESE SIZES!
2, 3, 4, 5, 6, 8, 10, 12, 15, 20 and 25 TONS

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HEAVY-DUTY OPEN-GAP PRODUCTION PRESSES

Our quantity production gives you highest quality at lowest cost.

THEY HAVE "EVERYTHING"...
- Dual Safety Hand Lever Controls
- Dual Electric Push-Button Controls
- Adjustable Stroke Control
- Reverse on Pressure or Distance
- Full Automatic Cycling
- Hannifin High Speed Hydraulic Index Tables
- Reciprocating Hydraulic Slide Feeds

USE THEM FOR...
- Assembly Operations
- Riveting — Staking
- Forming — Stamping
- Trimming Die Castings
- Trimming Plastics
- Molding Semi-Conductors
- Preforming — Compacting

MAY BE FLOOR MOUNTED—OPTIONAL, LOW-COST BASES AVAILABLE

Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132A. It tells the whole story.

HANNIFIN COMPANY
563 South Wolf Road • Des Plaines, Illinois

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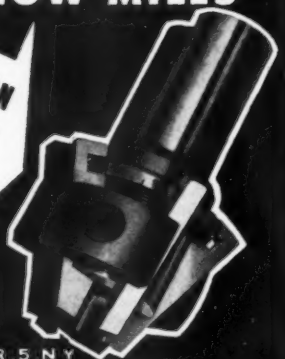
KUTMORE
ADJUSTABLE
HOLLOW MILLS

- Any COMBINATION of . . . Turning . . . Tapering . . . Facing . . . Chamfering . . . Trepanning in ONE PASS.
- Exclusive MICROMETER Adjustment Feature For Rapid Set-Up.
- Area Sales engineers for your immediate Problems.

WRITE FOR CATALOG 20 TP

PRECISION STARTS HERE



CARL WIRTH & SON, INC.
1625 CLINTON AVE. NO. ROCHESTER 5 NY

CIRCLE INFORM-A-GRAM KEY NO. 1122

Product News

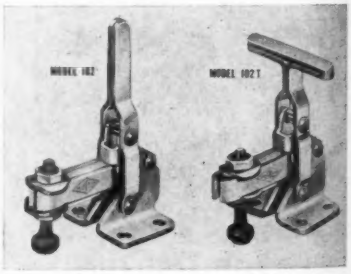
Versatile Counterbore

This unique Econo-Bore counterbore with replaceable HSS blades is ideal for toolroom or light production work. Blades of the same thickness can be used with different shanks and pilots. More than 30 different sizes can be made with the set, which includes five shafts, ten blades, and two extra pilots. Get details from The DoAll Co., Des Plaines, Ill., or Circle Inform-A-Gram No. P40.

Press Feed Adjustment

The Micro-Running Adjustment for Littell roll feeds on OBI and straight-sided presses enables the operator to control feed length to ±1/8" while the press and feed are running. Its conveniently located hand wheel control is safe and easy to operate. For details, get Bulletin A-15 for Automation Div'n, F. J. Littell Machine Co., 4101 N. Ravenswood Ave., Chicago 13 or Circle Inform-A-Gram No. P41.

Tiny Toggle Clamps



Two new miniaturized, vertical-handle toggle clamps with a rated holding pressure of 100 lbs have been added to the line of clamps made by Detroit Stamping Co., 330 Midland Ave., Detroit 3. Models 102 and 102T come with either a horizontal or straight base. For details, Circle Inform-A-Gram No. P42.

NEW BALANCED CUTTING ACTION

Severance

ECARNO-MILLS

THE ECONOMY MILL NEW DESIGN NEW CARBIDE

Make your money count! Replace more H.S. Rotaries and Mounted Grinding Points.

SOLID CARBIDE CUTTING HEADS

22 Shapes and Sizes Available

A NEW LOW PRICED HIGH CLASS PERFORMER

Made by the originator of ground-from-the-solid Rotary Files, and pioneer in this type of Carbide Mill, who presently offer the largest range of standard types, shapes, and sizes.

YOUR SPECIAL DEBURRING PROBLEMS ARE SOLICITED

OPERATE EFFICIENTLY AT USUAL CARBIDE SPEEDS, YET PERFORM BEAUTIFULLY AT THE SLOWER SPEEDS OF STEEL CUTTERS

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Severance TOOL INDUSTRIES INC.

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CIRCLE INFORM-A-GRAM KEY NO. 1131

Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.

AGET Manufacturing Company
1394 Church St., Adrian, Michigan

DUSTKOP STOPS DUST

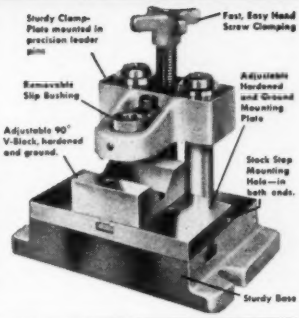
CIRCLE INFORM-A-GRAM KEY NO. 1132

REPCO *Time-Saving Tools*

ADJUSTABLE V-BLOCK DRILL JIG

Saves Set-Up Time— Increases Output

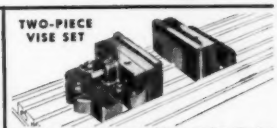
Here is a versatile and accurate V-Block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and T-slots in the mounting surface plates assure fast, easy, on-center adjustment. Drill capacity #80 to 5/16" diameter. Handles stock from 1/4" to 2" diameter.


Sturdy Clamp-Plate mounted in precision leader pins
Fast, Easy Hand Screw Clamping
Removable Slip Bushing
Adjustable Hardened and Ground Mounting Plate
Adjustable 90° V-Block, hardened and ground.
Stock Stop Mounting Hole—in both ends.
Sturdy Base

TRUE-CENTER ADJUSTABLE TOOL HOLDER

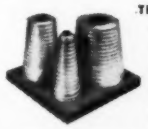
The REPCO Adjustable Holder is a precision-built tool, having two-piece construction which provides fast adjustment of the main body to compensate for as much as 1/32" machine misalignment. Cuts down on tool wear, breakage, and scrap.

TWO-PIECE VISE SET



Save time with this versatile 2-Piece Machine Vise Set. Use as general-purpose vise, angle-block, or separate clamping device. Opening limited only to length of machine base. Light, accurate, rigid. Two sizes: 6" and 8".

CHUCK JAW TRUING-RING SET



This Ring Set saves time, cuts cost of boring jaws. With correct diameter rings at hand, you gain hours of productive time. Plated rings range from 1" to 4" by 1/16" increments. Handy peg-type rack keeps rings in place.

COMBINATION LIVE-CENTER SET

Heavy-duty live center plus six interchangeable adapters, ranging from a point to 6 1/4" dia. ball. Saves costly set-up and machining time necessary to make large-diameter centers. Straight and various taper shanks available.

Write for complete information—Exclusive agent territories open.

REPCO ROCKFORD ENGINEERED PRODUCTS CO.

2322—23rd Avenue . ● Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1133

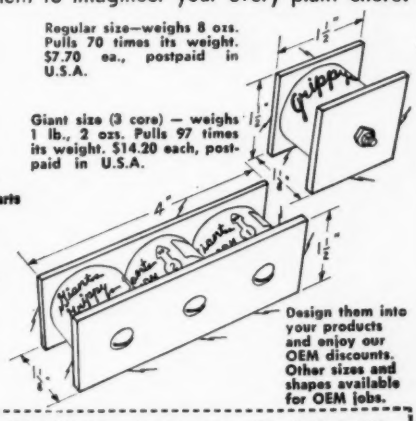
LET DILLEY BE YOUR HANDY CHORE-BOY!

DO YOU WANT A HANDY CHORE-BOY IN YOUR PLANT? Let the DILLEY Regular or Giant GRIPPY do your odd jobs. Use them to imagineer your every plant chore.

- Engineered by DILLEY, utilizing permanent Alnico magnetic parts with superb fittings. USE THEM:
- To hold parts for welding.
- As temporary jigs.
- To lift and move parts in plating tanks — on machinery — on conveyors — on benches, etc.
- To hold emergency lights — signs — gages.
- On layout tables — die work.
- "It's a Dilley"

Regular size—weighs 8 ozs. Pulls 70 times its weight. $7.70 ea., postpaid in U.S.A.

Giant size (3 core) — weighs 1 lb., 2 ozs. Pulls 97 times its weight. $14.20 each, postpaid in U.S.A.



Design them into your products and enjoy our OEM discounts. Other sizes and shapes available for OEM jobs.

THE DILLEY MANUFACTURING CO., 1600 Doan Ave., Cleveland 12, Ohio
Phone Orders-Call Liberty 1-0606

Please ship _____ Regular GRIPPY'S at $7.70 ea.;
_____ Giant GRIPPY'S at $14.20 ea.

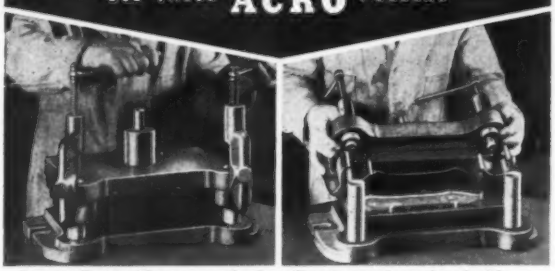
(Open account to rated firms. Otherwise payment with order. No COD's. Ohio customers add 3% sales tax or exemption form if applicable. Quantity prices on request.)

NAME .....
TITLE .....
COMPANY .....
CITY ..... ZONE ..... STATE .....

CIRCLE INFORM-A-GRAM KEY NO. 1134

FOR EASY, FAST UNIFORM SEPARATION OF DIE SETS...

USE THESE **ACRO** PULLERS



Separate die sets with even upward pull. Die sets separate evenly and safely.

When you have die set pullers that remove the punch holder from the die shoe by a straight upward pull and the punch holder slides upward from the die shoe simultaneously and safely from both leader pins, you have Acro Die Set Pullers and you're saving time.

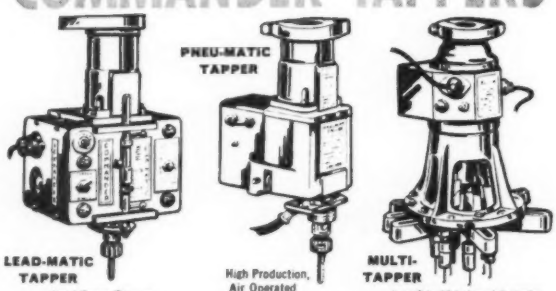
If you're not, this is how it's done with Acro Pullers: *Indexed* screw wrenches act as indicators, controlling the upward travel. This is an exclusive patented Acro feature and found only in ACRO DIE SET PULLERS. It may pay you to investigate. Write for further free information today.

OTHER* ACRO *TIME SAVERS FOR YOUR SHOP include Acroflex, drill rod racks, leader pin oilers and wing nuts. Write for complete descriptive folder. Ask for bulletin TP59.

ACRO METAL STAMPING COMPANY
3387 E. Reservoir Ave., Milwaukee, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1141

COMMANDER TAPPERS



LEAD-MATIC TAPPER
Lead Screw Tapper
Range: 0-80 to ¼"-16

High Production, Air Operated
Range: 0-80 to ¼"-16

MULTI-TAPPER
taps 2 to 15 holes at 1 stroke.
Adjustable hole pattern

a Type and Size for Every Job!

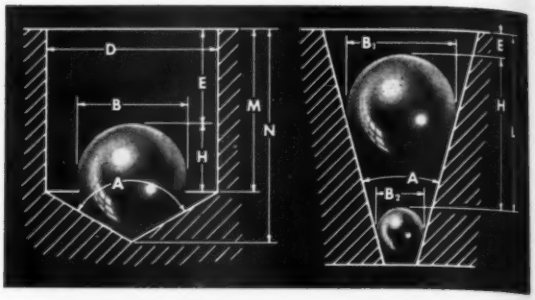
MIDGET TAPPER
Pressure Sensitive Drive
Range: 0-80 to 10-24

STANDARD TAPPER
Adjustable Torque Control
Range: 0-80 to ⅛"-16

Commander Tappers are made in 10 models —each designed to handle tapping jobs over a wide range. From the Commander Tapper line, you can select the right unit to give you the exact performance your job requires. Whichever Commander Tapper you select, you will get unequalled performance and tapping economy. Sold and serviced by drilling and tapping specialists. Write for the Commander Production Tool Catalog and name of nearest Distributor.

Commander MFG. CO.
4008 WEST KINZIE STREET • CHICAGO 24, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1142



MASTER BALLS

- **For simplified checking** of hole depth, ID's, internal tapers — locating holes and internal grooves — many other applications in shop, tool room and gage room.
- **Accurate to .000010" on size and sphericity. Hardened and cold-stabilized for lasting precision.**
- **Furnished in sets or individually — 3/64" to 1" or larger.**

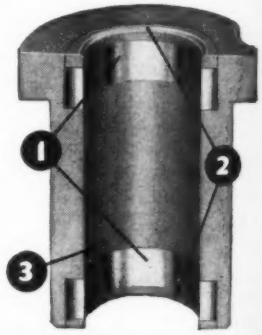
FREE BULLETIN 552 gives methods and formulas for hole-checking, and details on Master Balls. Write for it!

INDUSTRIAL TECTONICS, Inc.
ITI
MANUFACTURERS OF PRECISION BALLS AND BEARINGS
3683 JACKSON ROAD
ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1143

CARBIDE INSERTED MEYCO BUSHINGS Can Cut Production Costs!

MEYCO carbide inserted drill jig bushings have been successfully saving money on production runs for the past decade. Performance: same as solid carbide, but need not be handled with kid gloves. Greater economy, because of long life at less cost. You can enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings. Get the full story now: write for new Bushing Catalog No. 41.



***PATENTED**

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

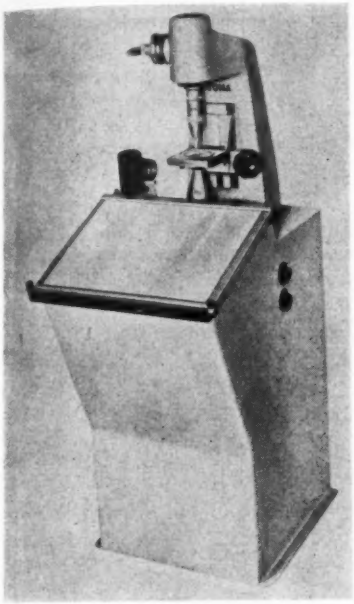
MEYCO W. F. MEYERS CO., Inc.
BEDFORD, INDIANA
A famous name in precision tools since 1888

CIRCLE INFORM-A-GRAM KEY NO. 1144

Product News

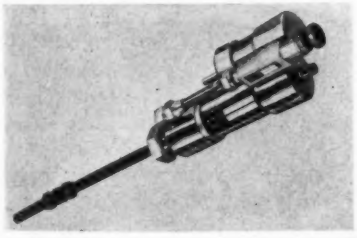
Optical Comparator

Inspection and testing of precision parts are aided by the Swiss-made Isoma M108 optical comparator. Magnifications range from



10X to 100X and images are free of distortion because lighting is uniform to the edge of the screen. Write S & S Machinery Co., 140-53rd St., Brooklyn 32, N. Y., or Circle Inform-A-Gram No. P43.

Hydraulic Power Check

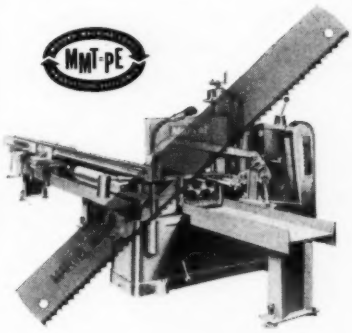


A Pow-R-Trol is an improved hydraulic power check unit which cushions cylinder thrust by opposing it with an accurately controlled counter force. Used with air, oil, or water-operated cylinders, standard models can provide strokes up to 20″ and operating pressures up to 3000 psi. APPCO Div'n of Pokorny Industrial Products Co., 10643 Memphis Ave., Cleveland 9, or Circle Inform-A-Gram No. P44.

a message to owners of

MARVEL HACK SAW MACHINES

If you are the owner of a MARVEL Hack Saw Machine, check the name on the blades being used in it. If they are not MARVEL Blades, the chances are very good that you are not getting all the cutting-off speed, accuracy, and economy you paid for when you bought a MARVEL Saw. Consider this fact. The hack saw *blade* is the cutting tool that actually does the cutting job. If the machine is expected to deliver its full efficiency, the blade must possess a ruggedness comparable to that of the machine. Isn't it logical, then, that the blades you use be as carefully selected as the machine itself? Here is another fact: The MARVEL High-Speed-Edge Hack Saw Blade was designed specifically to withstand the heavy feed pressures and high cutting speeds your MARVEL Hack Saw can deliver. Only MARVEL UNBREAKABLE Hack Saw Blades can be safely tensioned taut enough to provide the maximum rigidity of the cutting tool necessary for accurate cutting-off; and at the same time, protect both the operator from injury and the machine from damage that so frequently occurs with "breakable" blades.



Why not be certain your MARVEL saw is delivering the high performance you had originally purchased, by using the only blade capable of utilizing the power and accuracy built into the machine? MARVEL Hack Saw Machines and MARVEL High-Speed-Edge Blades are an unbeatable combination. MARVEL High-Speed-Edge Hack Saw Blades are stocked and sold by leading Industrial Distributors everywhere.

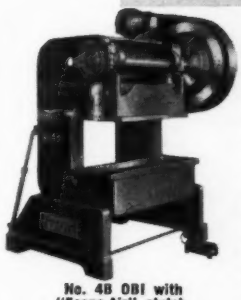
ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Avenue • Chicago, Illinois

MARVEL Metal Cutting SAWS

CIRCLE INFORM-A-GRAM KEY NO. 1151

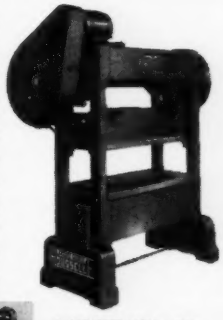
High-Output with ROUSSELLE

DOUBLE-CRANK PRESSES



No. 4B OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes

STRAIGHT SIDE—Die space up to 24 in.; bed space up to 6 ft. between uprights.

SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Rousselle Presses are sold exclusively through Leading Machinery Dealers.

CIRCLE INFORM-A-GRAM KEY NO. 1152

NEW ALINA DIAL COMPARATOR SET NO. 99

The 3 purpose instrument with unlimited application in your inspection department

Use as Dial Indicator graduated to read in .0001".

Use as Bore Gage covering a range of .200" thru 5.090" and reading in .0001".

Use as Dial Test Indicator graduated in .0005".

The No. 99 incorporates a high quality dial indicator together with all the necessary gage heads and extensions. It may be used directly at your machines or clamped to your fixtures. Furnished in handsome plush-lined case.

Dial Test Indicator Set No. 98, a modification of the No. 99, is especially designed for applications where measurements must be taken in deep holes, slots, etc. Write for detailed brochure.

WRITE FOR ILLUSTRATED LITERATURE.

ALINA CORPORATION

122 East Second Street, Mineola, Long Island, New York

Alina Corporation, 853 East 8 Mile Road, Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1161

Reduce Tool Costs with WETMORE ECONOMY MODEL AND 10050 Port Contour Cutters

Stocked for Immediate Delivery, Carbide Tipped for Tubing OD Sizes ⅛" through 2"

These economically priced tools reduce tool costs while offering specific advantages for prototype, model or tool room work. Spot face diameters are larger than conventional AND sizes and will machine larger bosses or provide extra diameter for special grinds. These tools are excellent for the production of Stainless Steel AND 10050 Ports.

Wetmore manufactures and stocks an extensive line of precision Port Cutters and Flat Form Tools for standard hydraulic fittings in both high speed steel and carbide. The wide range of selection of Wetmore Tools will provide the cutters best suited to your requirements and insure the fine finish and accuracy needed for the highest quality fittings.

Write for New Wetmore Catalog—Complete information given on ordering, prices, tool description and applications.

Wetmore Tool & Engineering Co. Phone: ANgelus 9-7266 TWX: LA 2085

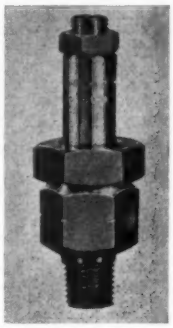
5320 E. Washington • Los Angeles 22, California

Wetmore Tools

CIRCLE INFORM-A-GRAM KEY NO. 1162

Product News

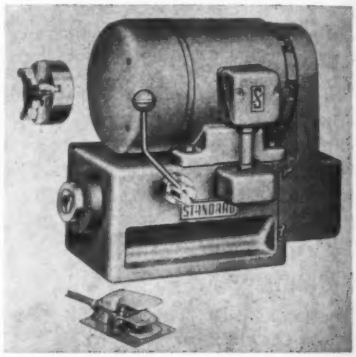
Compressor Control



The Gov-N-Air precision air governor is designed to activate air-operated equipment such as continuous running compressors. It's adaptable to pressures from 20 to 250 psi and cut-out and cut-out pressures ranging from 4-14 psi upwards. Ask for Catalog No. 158 from Wilkerson Corp., 1640 W. Girard, Englewood, Colo., or Circle Inform-A-Gram No. P45.

Speed Lathe

Heavy-duty service on secondary operations such as burnishing, lapping, spinning, and reaming of



small parts is delivered by the new piggy-back belted-motor-drive speed lathe. Spindle speeds range from 180 to 3600 rpm and selection can be made for only one speed or for two- and four-speed combinations. Write The Standard Electrical Tool Co., Mt. Hope & Sixth Sts., Cincinnati 4, or Circle Inform-A-Gram No. P46.

BUY U.S. SAVINGS BONDS TODAY!

LEIGH Pocket Tools

Scribers Both "fixed point" (left) and "interchangeable-reversible-point" types (right) come with 3/64" x approx. 1/2" carbide rods, inserted and brazed in points. Can be re-ground again and again. Give years of service. Accurately machined collet-chucks hold points securely. Points reverse for safe carrying in pocket. Mark any material.

(Above) Fixed Point Scribers—for bench or fixture use.

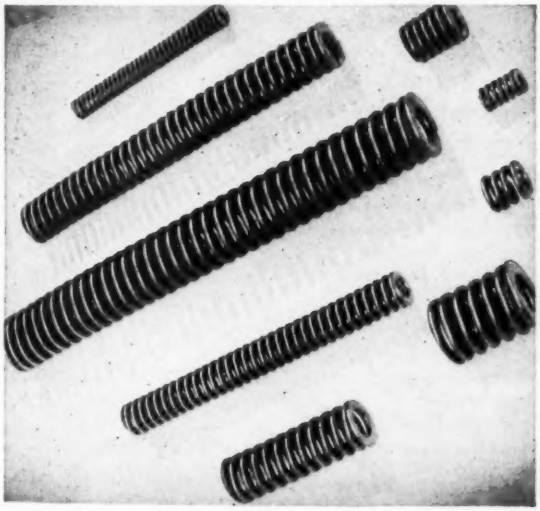
Magnets No. 434 (magnet only) and No. 634 (magnet and scriber) have extra power, permanent magnets. Easily remove chips from blind holes, threads, etc.; recover, gather, and hold small parts—a daily need.

Points (Left) Extra points for use in collet-chuck type LEIGH Scribers come in 6 types "Straight" "90° angle" and "45° angle" points with carbide insert rods. And, "Straight" and "90° angle" and "45° angle" of high speed steel.

If your distributor can't supply LEIGH Pocket Tools, order direct.

SPRING SPECIALTY CO.
31 5th Avenue • Maywood, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1171



Die Springs

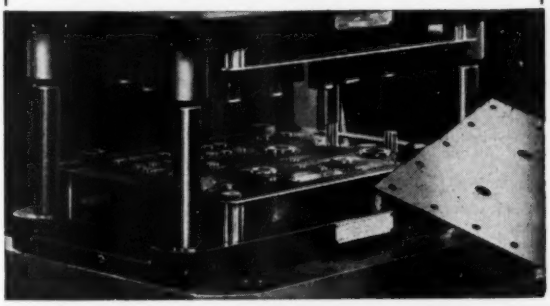
Chrome vanadium die springs in stock in a wide variety of hole and rod sizes, lengths and deflections. Medium, medium-heavy, heavy duty for increased life and reduced down time. Write for list of specifications and prices, and name of nearest distributor.

Raymond Manufacturing Division
Associated Spring Corporation
Corry, Pennsylvania

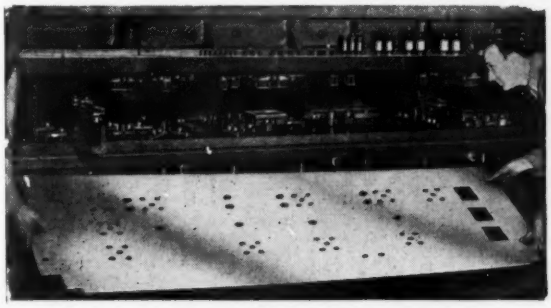
5937

CIRCLE INFORM-A-GRAM KEY NO. 1172

OVER 2700 PLANTS
are saving money with
WHISTLER DIES



MAGNETIC PERFORATING DIES
All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES
All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.

manufacturer of all types of CUSTOM DIES for over 40 years

WRITE FOR COMPLETE DETAILS

S. B. WHISTLER & SONS, INC.
748 Military Rd., Buffalo 23, N. Y.

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog
☐ More information on custom die work

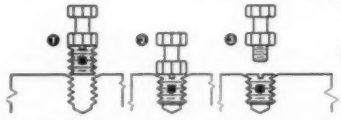
NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1173

E-Z-LOK INSERTS

- Self-locking, threaded inserts.
- Vibration-resistant with patented NYLOK feature.
- Simple to remove and re-use.
- Use in aluminum, magnesium, plastic or cast-iron.

EASY 1-2-3 INSTALLATION



1. Drill, countersink (90° to 100°).
2. Tap National coarse thread.
3. Install with bolt or screwdriver.

Distributors Wanted TOOL COMPONENTS, INC. Box 1036, Gardena, California

CIRCLE INFORM-A-GRAM KEY NO. 1181

low cost HYDRAULIC KEYSEATER

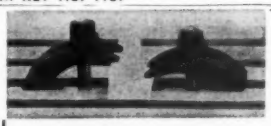
cuts standard, tapered keyways ¼" to 2" wide

- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

Send for Bulletin 34

E. W. BLISS COMPANY
CANTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1182



Unconditionally Guaranteed!

NEW INSTA Hold-Down CLAMPS

"Clamps Without Shims"

Holds work securely on: Jig Borers • Planners • Punch Presses • Drill Presses • Mills • etc.

Write for Bulletin 60

Insta clamp 2420 Home Place Dearborn 8, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1183

Save 10% of new gage block costs through ELLSTROM Gage Block Trade-In Plan!

Write for complete information today!

ELLSTROM STANDARDS DIVISION • DEARBORN GAGE CO.
22038 BEECH STREET • DEARBORN, MICHIGAN
Measuring in Millionths for Three Generations

CIRCLE INFORM-A-GRAM KEY NO. 1184

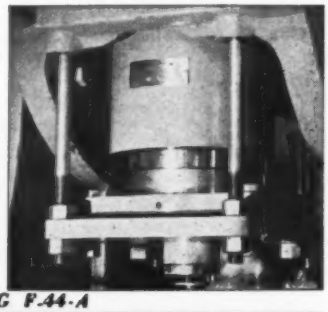
DIE CUSHIONS

by Dayton Rogers

FOR ALL PUNCH PRESSES

to assure accurate working pressure on all dies

- Single installations from 1 ton to multiple installations of unlimited capacity, standard or designed on the job.
- Quotations on request.
- Best possible delivery.



11 Ton Full Universal Pneumatic Die Cushion Installed on Inclinable Press. →

WRITE FOR CATALOG F-44-A

DAYTON ROGERS *Manufacturing Company*

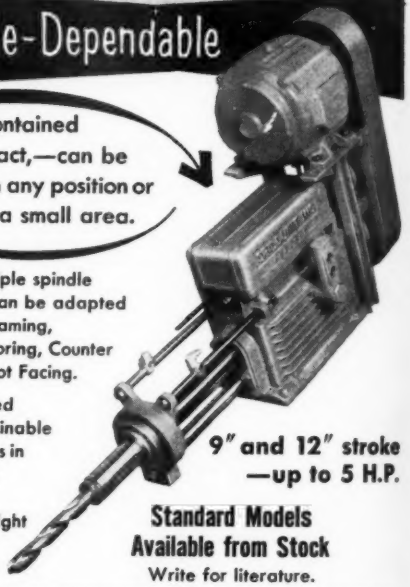
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1185

DRILLUNIT *Solves* Drilling Problems

Flexible-Dependable

Self contained —Compact,—can be mounted in any position or angle, in a small area.



Single or Multiple spindle applications, can be adapted for Drilling, Reaming, Chamfering, Boring, Counter Boring and Spot Facing.

Stroke and feed variations obtainable without changes in the unit.—Step feed drilling possible with slight modification.

9" and 12" stroke —up to 5 H.P.

Standard Models Available from Stock

Write for literature.

DRILLUNIT, INC.

HYDRAULIC DRILL UNITS

3267 Wight Street • Detroit 7, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1186

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

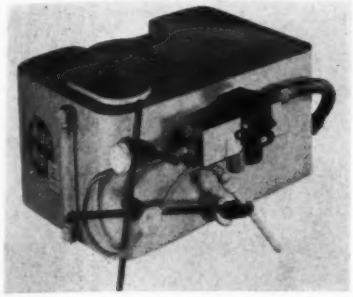
HEIMANN MFG. CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1187

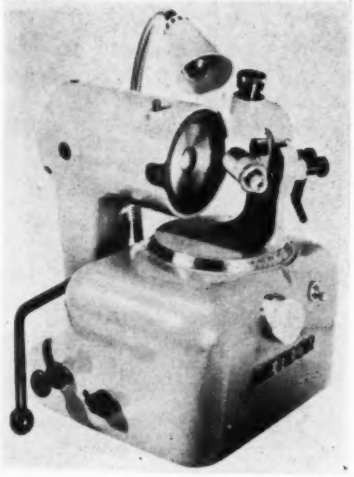
Product News

Coolant Generator

The Model D-60 mist coolant generator attaches to drill presses having 2 3/4" columns, so air and coolant are controlled automatically by the up and downward movement of the press spindle. Attachment of the tank to the column permits operator freedom and greater press work capacity. Ask for details on the Mistic Mist from Aetna Mfg. Co., 188 S. York St., Bensenville, Ill., or Circle Inform-A-Gram No. P47.



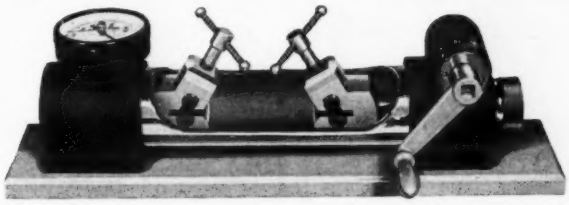
Twist Drill Grinder



The new KBS-6 Meteor twist drill grinding machine sharpens milling cutters and right- and left-hand twist drills from 0.008" to 0.236" and up to 6 1/4" long. Point angle is adjustable from 90° to 180°, relieving is adjustable from 0° to 20°, and a high precision 4-jaw chuck allows the tool to be clamped and unclamped instantly. Associated American Winding Machine, Inc., 750 St. Ann's Ave., New York 56, or Circle Inform-A-Gram No. P48.

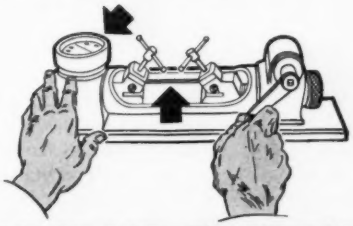
Always Handy, A PORTABLE Tensile Tester

Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Use it in the shop, the lab, or in the field.



The maximum load requires only a moderate pull on the crank. Test results are easily read from the load gauge. Simple to use anywhere, any time. Write for catalog sheet and price.

Information on other Detroit standard and special tensile testing machines, with up to 40,000 lbs. capacity, will also be sent upon request.



DETROIT TESTING MACHINE COMPANY
9386 Grinnell Avenue, Detroit 13, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1191

Every TOOL ROOM NEEDS THIS BIG Free REID CATALOG

Now big FREE 88 page catalog listing 1800 accessories and components needed in every tool room, such as malleable machine handles c.i. hand knobs, hand wheels, etc. All are top quality and low cost. Orders welcome for one or a thousand.

BALL HANDLES — THREADED

ROUND PLASTIC — OVA OVAL PLASTIC — MUSHROOM PLASTIC

Will give your product that "dressed-up" appearance. Made in a wide variety of diameters and thread sizes. Round and oval plastic supplied in red or black. Polished steel handles also supplied. Low prices and finest quality.

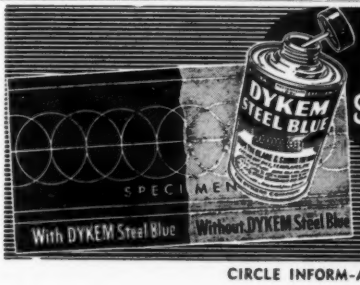
COMPRESSION SPRING ASSORTMENT

Available in many sizes ranging from 3/32" to 1-1/2" diameter. Made from music wire. All springs 10" long. Select the size required and cut to length wanted. Saves time and money.

Extension spring assortment, ranging in diameters from 1/8" to 1". All are 11" long. Low prices.

REID TOOL SUPPLY CO.
MUSKEGON HEIGHTS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1192



DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1193

Yoder Rotary Slitters reduce inventory... speed production

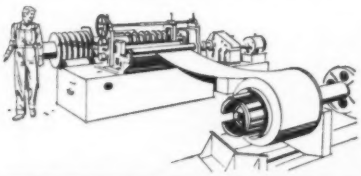
To help meet the demands of tight production schedules, YODER Slitters reduce mill-width stock quickly and economically to desired widths. If your needs are as low as 100 tons per month, time and manpower savings alone will offset the cost of your YODER Slitter in a matter of months, while reducing basic inventories. Compactly designed, standard YODER Slitters are built to handle standard coil widths... completely engineered lines for special requirements.

YODER accessories, such as coil cars, swivel unloaders, scrap choppers, scrap disposers, plate levelers and coil boxes, make stock handling fast and easy.

YODER also makes a complete line of Cold Roll-Forming equipment and Pipe and Tube Mills. To profit from YODER'S years of engineering and service experience, contact your local YODER representative or send for the YODER Slitter Manual.

Investigate the many advantages of YODER-engineered Slitter Installations. Write today for this comprehensive, 80 page YODER Slitter Manual... it's yours for the asking!

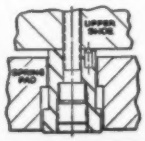
THE YODER COMPANY
5501 Walworth Avenue • Cleveland 1, Ohio



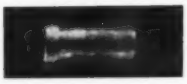
ENGINEERING YODER MANUFACTURING ROTARY SLITTING LINES

CIRCLE INFORM-A-GRAM KEY NO. 1201

HIGH STRENGTH DIE PAD RETAINER SPOOLS



Replaces shoulder screws to strengthen junction between pad and shoe—reduce die pad failures. Large diameter for good footing, cyanide hardened for excellent wear. Load ratings from 900 to 3,000 lbs. Stocked for quick shipment. Send for catalog and quote. Dealer inquiries invited.



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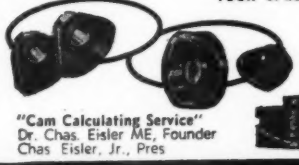

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Gage Block Inspection and Calibration Service prevents confusion, errors, costly scrap losses
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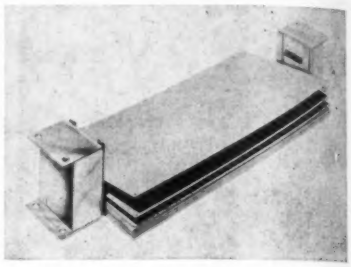
CIRCLE INFORM-A-GRAM KEY NO. 1206

Product News

Sheet Separator

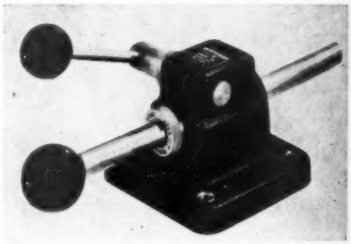
Stacked sheets of steel are separated and "floated" by the Magnetool unit to reduce equipment damage due to multiple sheet



feeding. Sheets ranging from 32 to 7 ga are magnetized so they repel each other, permitting the operator to quickly pick up one piece at a time. Adjustable or preset modular models are available. Multifinish Mfg. Co., 26341 W. 8 Mile Rd., Detroit 40, or Circle Inform-A-Gram No. P49.

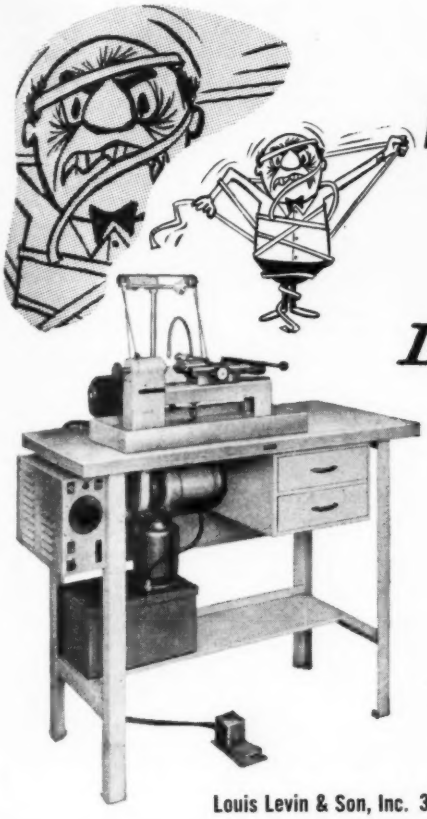
Quick Jig Locking

Simple turning of the pressure control on the new Adjusto-Quick Jig-Loks automatically adjusts the holding pressure from 1 up to 1500



lbs, and easy hand pressure locks and securely holds the work. They are easily attached to fixtures and are available in two models with base dimensions of 4" x 4" or 5" x 5". Contact the L-W Chuck Co., 72 S. St. Clair St., Toledo 4, Ohio, or Circle Inform-A-Gram No. P50.

U. S. SAVINGS BONDS ARE AVAILABLE. SEE YOUR PAYMASTER FOR DETAILS.



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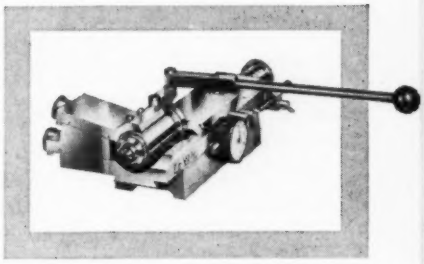
Designed for the most precise drilling of small holes. The drilling spindle, as well as the head stock spindle, revolves and thus the maximum straightness and concentricity are assured. The feed is so arranged that it does not depend on the operator's sense of feel and the smallest drills may be safely used.



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Louis Levin & Son, Inc. 3610 So. Broadway Los Angeles 7, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1211

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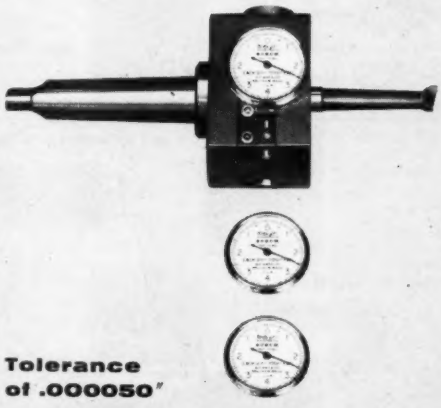

Tolerance of .000050"

Put your Bokum tool in the Bokumicro-Dial Boring Head*. For set-up, bore a hole a few thousandths undersize. Measure the hole and move the dial indicator (which moves the tool) to the exact reading you wish —you can read directly 50 millionths of an inch! You get absolute accuracy on production runs or toolroom work. It's Bokumagic! Write today!

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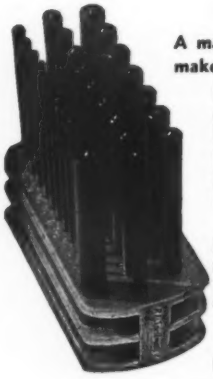

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A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand — sizes 3/32" to ½" by 1/64" plus handy 17/32" size—length 4⅞". PRICE only $19.40

Single sizes available.

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SPEED UP DRILLING & TAPPING JOBS!

JOHN'S DRILL JIG

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from ⅛" to 8" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs to minimum for 10 to 100,000 pieces.

Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

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A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

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If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

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Quality Deburring & Chamfering Tools for FAST PRODUCTION

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for machine deburring and chamfering of line-drilled and otherwise inaccessible hole surfaces.

for the automatic deburring and chamfering of front and back hole faces simultaneously in sheet metal, etc.

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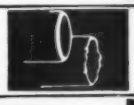
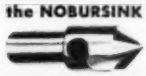
for deburring and chamfering curved or elliptical hole surfaces.

for deburring and chamfering the ends of rods, tubes and bosses.



the NOBUROD

the NOBURSINK



for deburring and chamfering openly accessible hole faces.

NO BUR TOOLS **NOBUR MANUFACTURING CO.**

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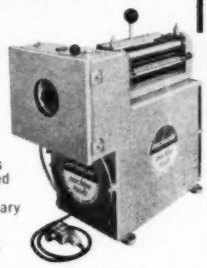
CIRCLE INFORM-A-GRAM KEY NO. 1225

What's NEW in Press Room Equipment?

See these **benchmasters** for **improved feeding, better low-cost production!**

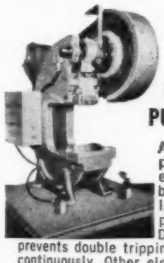
BENCHMASTER "MAF" MACHINE



Motorized Automatic Feeding (MAF) Machines supply uniform measured lengths of flat strip or coil stock to any secondary machine. They cycle either manually or by linking to a machine for automatic feed. Stock is pulled from a reel, or preferably, from a KOIL-KRADLE slack loop. Feed length is adjustable from 3" to 60". Stock widths up to 12" wide. Other capacities on special order.

BENCHMASTER "FS" MACHINE

The Combination Length-Feeding and Straightening (FS) Machine automatically straightens flat strip or coiled stock and supplies measured lengths to a secondary machine. It also pulls from a reel or KOIL-KRADLE slack loop. By first removing curl, kinks, etc., stock feeds faster with greater accuracy, improves production and quality of parts.



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A safe, manual or automatic punch press clutch that eliminates sliding keys, breakage hazards and time lag . . . pickup occurs at any part of flywheel rotation. Dual purpose cam switch prevents double tripping. Single trips or operates continuously. Other electrical control settings for manual set-ups, foot control, 2 button hand control or automatic operation.

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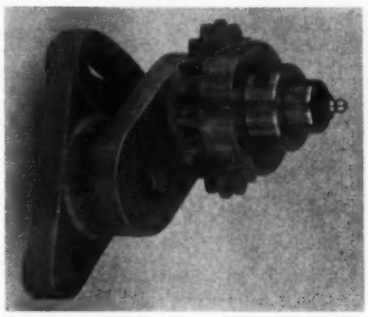
CIRCLE INFORM-A-GRAM KEY NO. 1231

Product News

Takes Up The Slack

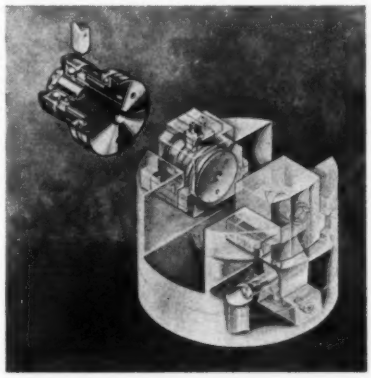
The Universal drive tensioner takes up slack in chain and belt drives and can be used as an idler bracket for change gears. Two-



bolt mounting of the base makes it easily adaptable to most machine frames. It uses a rotating arm and adjusting slot to permit vertical and horizontal positioning through a full 360° arc. Brewer Machine & Gear Co., 1441-43 N. Second St., St. Louis 6, or Circle Inform-A-Gram No. P51.

Power Chuck

A new, heavy-duty power chuck with interchangeable jaws lets the operator index manually without touching the work or releasing the



pressure. A lock screw and slide plate mechanism on one or both jaws allows simple, fast indexing to many different positions and small index angles. Bodies range from 12" to 36" dia. For details, write Dept. IC-9, The Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn., or Circle Inform-A-Gram No. P52.

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NEW RCA LIMIT-SIGNALING COMPARATOR

for both contact and air gaging

The RCA LSC Comparator speeds up accurate manual checking and sorting since the operator only has to observe the high, low, and OK limit lights. Ideal for incoming or production line inspection. Extremely reliable and accurate to .000,050".

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Operates on RF frequency. No lag between contact with work and meter indication.

FAST, EASY SET-UP
Gage is linear over full scale, making it a simple matter to set up limits.

EXTREMELY VERSATILE
Can be used with standard height stand or special fixture for manual inspection, for automatic in-process, or post process inspection and segregation. Standard air-electronic adapter kit permits use for air gaging.

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RCA Tmk(s) ®

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FLEXIBLE
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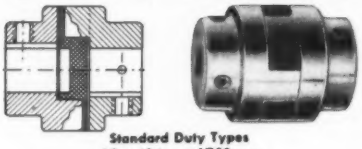
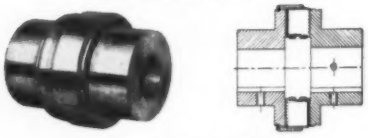
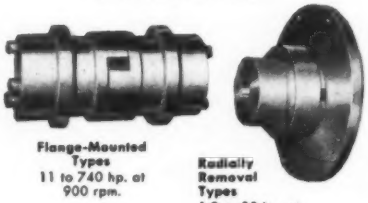


Standard Duty Types
.05 to 40 hp. at 1750 rpm.



Medium and Heavy Duty Types
2.6 to 810 hp. at 100 rpm.



Flange-Mounted Types
11 to 740 hp. at 900 rpm.

Radially Removal Types
1.9 to 30 hp. at 100 rpm.—2 to 40 hp. at 1800 rpm.

Put Trouble-Free Performance Into Your Equipment

COMPARE THESE FEATURES:

- A type and size perfectly suited to your application.
- Year-after-year dependability, regardless of load or operating conditions.
- Completely machined for ease and speed of alignment.
- No lubrication required.
- Simple, rugged construction—few parts and no intricate mechanisms.
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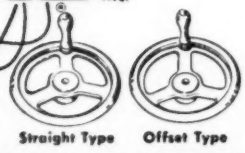
Tomco INC.

HAND WHEELS



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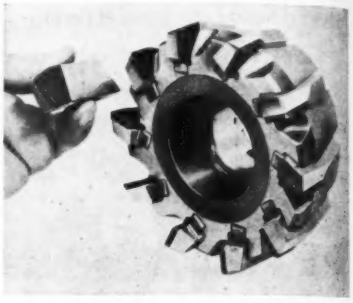
Product News

Longer Lasting Blades

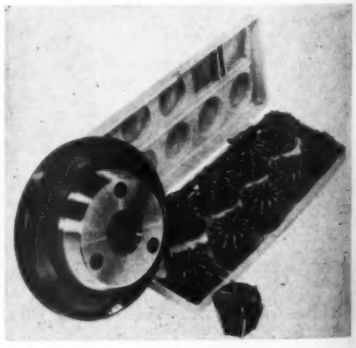
Blade life is upped by 36% with the new Series 7888 carbide milling cutter blades because they can be re-ground more times than



others. They're for machining cast iron, aluminum, magnesium, and steel and are available for either right- or left-hand cutters with 4″ to 32″ dias. Seventeen regrinds are possible on each blade. For details, contact Wesson Co., 1220 Woodward Hts. Blvd., Ferndale 20, Mich., or Circle Inform-A-Gram No. P53.

Cost Cutting Collet Chuck

Easier, faster collet changing, a 42% increase in lathe spindle capacity, and a chucking range of 0.100″ are features of the new low-cost Model 50 lathe collet



chuck. It has a hand-operated, nose-type closure and Rubber-Flex collets and can be used to chuck tubing and fragile materials, as well as round stock, on drill presses and milling machines. Write The Jacobs Mfg. Co., West Hartford, Conn., or Circle Inform-A-Gram No. P54.

TWO NEW MINIATURE GRIPCO FASTENERS

FOR

- **Hard to reach assemblies**
- **Thin metal applications**
- **Automatic feeding**
- **LOW COST fasteners**

Gripco Miniature Pilot Weld and Clinch Nuts, with or without the famous Gripco locking feature, provide low cost fastenings in blind assemblies or as extra threading depth for thin metals. Miniature size ideal where space is limited. Sizes #4 through ¼" in Miniature Series, fine and coarse threads. Sizes ¼" through ⅝" are available in standard dimensions.

Large inventories carried for immediate shipment. Brass and Aluminum made to special order.

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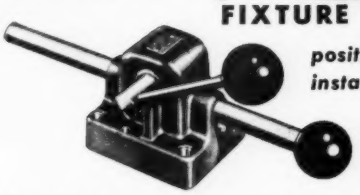
CIRCLE INFORM-A-GRAM KEY NO. 1251

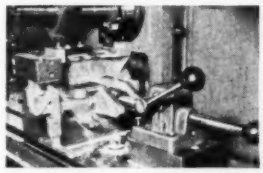
heinrich Grip-Master FIXTURE LOCKS

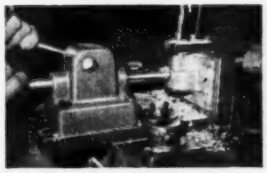


positive clamping instant setting

SIMPLIFY JIG AND FIXTURE DESIGN

LONG TRAVEL provides plenty of chip clearance, easy loading and unloading. Gets into hard-to-reach places. Base sizes: Model 2FL, 3⅜" x 3¼"; Model 9FL, 4⅜" x 3⅜". Bar lengths from 8" to 18". Here are two examples of Grip-Masters speeding production in drilling and milling operations.





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HEINRICH TOOLS INC., DEPT. 130-F
RACINE, WISCONSIN

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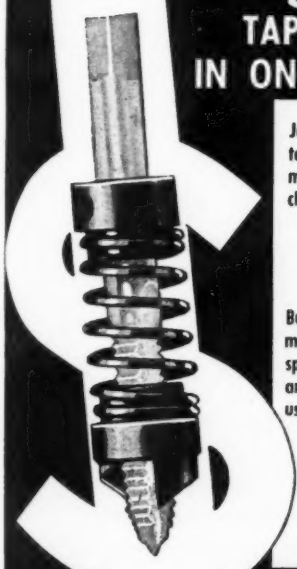
Two for One
TAP & DEBURR IN ONE OPERATION



Just slip Burr-Bit on any make tap—holes are deburred automatically, leaving a smooth, clean chamfer.

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1 operation—
instead of 2!

Burr-Bit by Vernon Devices is made of the finest quality high speed tool steel. It fits all 2, 3 and 4 flute taps, and can be used on almost any material.

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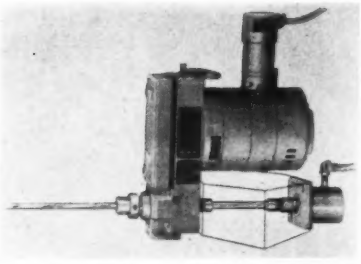
Product News

Gun Drill for Lathe

The Model 3-203 gun driller is easily mounted on ram or saddle type lathe turrets. Its 3/4" core, 4-speed spindle handles gun drills from 3/16" to 5/8" dia. Special design includes short overhang and swivel connection for rotation of the driller with the turret. Write



the Ward-Riddle Co., 241 Myrtle St., Ravenna, O., or Circle Inform-A-Gram No. P55.

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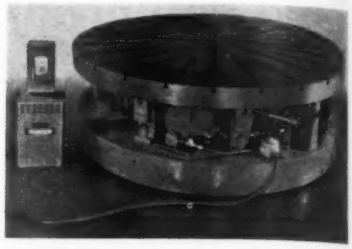
Bearing loads up to 90,000 lbs can be handled on a 102" dia precision horizontal rotary table featuring accuracy of 5 sec of arc.

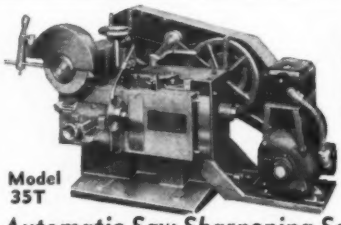


Preliminary positioning is done by a visual counter and final positioning is done manually with the aid of a miscroscope. Other sizes are available. Get data from Machine Products Corp., 6771 E. McNichols, Detroit 12, or Circle Inform-A-Gram No. P56.

Lead Screw Tapping Spindle

These new lead screw tapping spindles, made in all sizes of nose ID's from 7/8" to 3", can be substituted for standard slip spindles

because they're made in matching diameters. They're compactly designed with accurate leads for cutting uniform threads. Get data from Seibert & Sons, Inc., Chenoa, Ill., or Circle No. P57.



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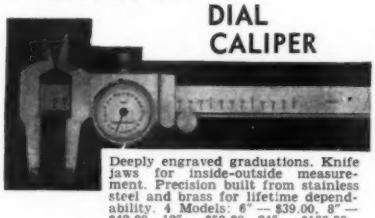

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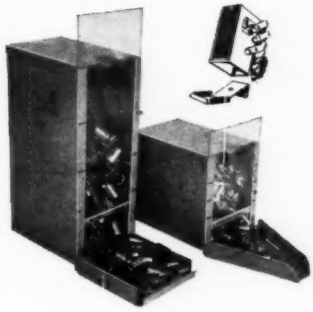

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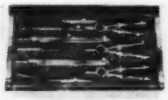

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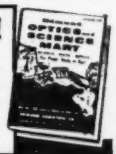

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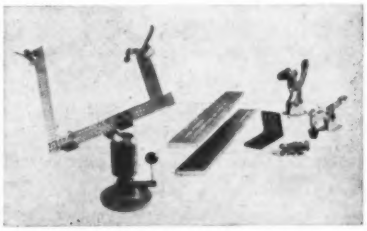
Product News

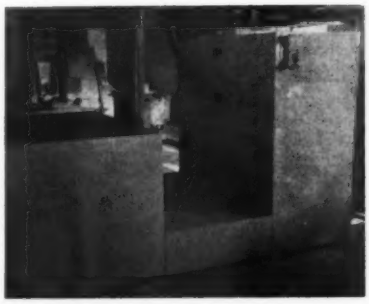
Versatile Work Holder



This workholder can be quickly and easily changed to any shape to accommodate different sizes of work, using only a screwdriver. The Erect-Your-Own kit No. 391 contains two 18" perforated strips, three 90° connecting angles, two toggle clamps, and 12 screws and nuts. Individual parts are also available. Contact the Wilton Tool Mfg. Co., Inc., Schiller Park, Ill., or Circle Inform-A-Gram No. P58.

Dust Collecting Table

This new high velocity downdraft dust collecting bench has the fan and filter compartment separate from the grated working surface, but connected by a flat duct only 12" high. Downtime for repositioning the work is eliminated since the operator has easy access to the work from all sides. Ask for details of the 1-24 BR bench from Wolverine Equipment Co., 31 Main St., Cambridge 42, Mass., or Circle Inform-A-Gram No. P60.



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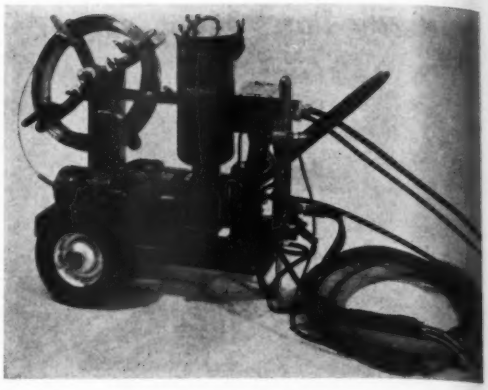
Wheel this welding wagon where you want it and save time and money in production welding. Its consumable steel wire electrode is continuously fed into the arc where it is magnetically coated with powdered flux carried by the CO_2 gas shield. Blowpipe or pistol type torches are available. For details, contact Linde Co., Div'n of Union Carbide Corp., 30 E. 42nd St., New York 17. Circle No. P59.



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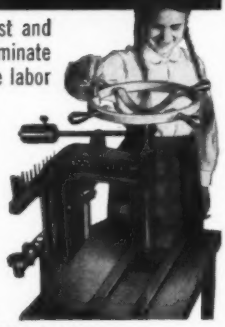

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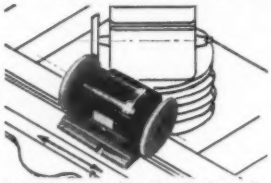

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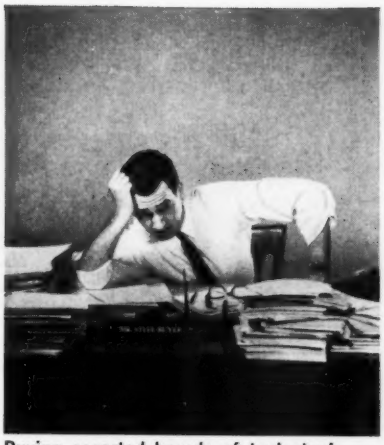

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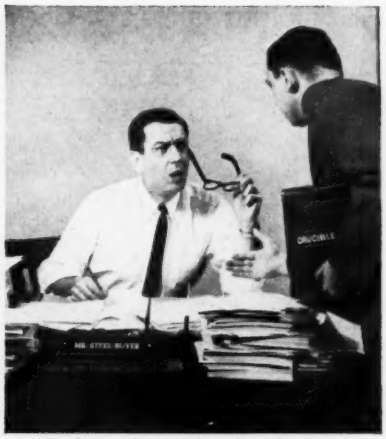
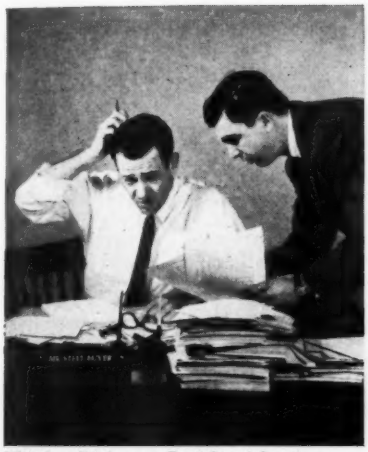


purchasing and receiving departments — manufacturing and accounting, too.



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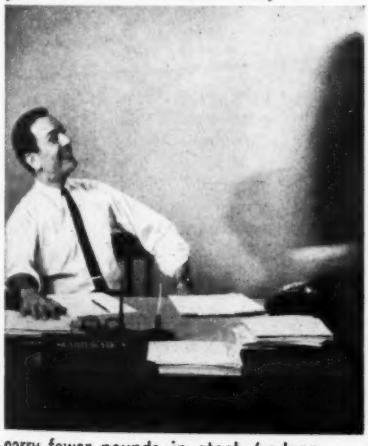
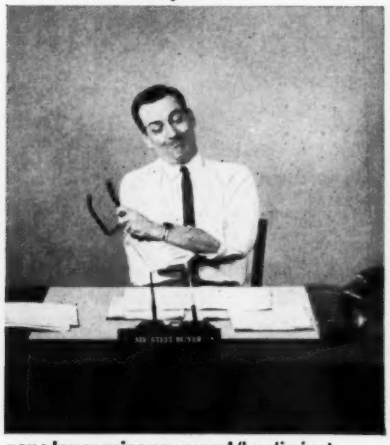


carry fewer pounds in stock (reduce chances of inventory "mix-ups"), and...



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CIRCLE INFORM-A-GRAM KEY NO. 129

CUMULATIVE EDITORIAL INDEX FOR 1960 ISSUES

TOOLING & PRODUCTION Magazine

The number of subjects in which T&P's editors present material in just a few issues adds up very rapidly. Most articles are of lasting interest and have future reference value in solving tooling and production problems.

This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this useful index.

The Publisher

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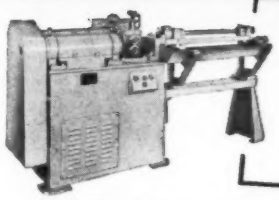
infinite, variable speed, electrically controlled,

Automatic Wire Straightening and Cutting Machine!



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It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

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NEW SIZES ADDED DAILY . . . IF NOT LISTED—WRITE

DEALER INQUIRIES INVITED

WHEN REQUESTING QUOTATIONS ALWAYS MENTION QUANTITIES

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72-76-80-90
1	48-56-60-64-80-90
2	48-52-54-56-60-72-80-96
3	36-40-60-64-72-80
4	30-32-38-42-44-56-60-64-72-80-90
5	22-27-30-32-36-38-42-48-50-56-60-64-72-80
6	24-28-30-36-38-42-44-48-56-60-64-72-80
7	28-30-32-34-36-38-40-44-48-64
8	24-26-28-30-38-40-44-48-56-60-64-72-80
9	24-28-30-32-36-40
10	18-20-22-26-28-30-34-36-40-48-56-60-64-72-80-96
11	20-22-24-28-30-32-36
12	20-22-26-27-30-32-36-38-40-48-56-60-64-72-80
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18	16-18-20-24-32-40
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20	14-16-18-20-24-32
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24	14-16-18-22-24
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30	14-16-20
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2-7/16	8-10-12-14-16-18-20
2-1/2	4-6-8-10-12-14-16-18-20
2-9/16	8-10-12-14-16-18-20
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3-7/8	4-8-10-12-16
4	4-6-8-10-12-16
4-1/8	4-8-10-12-16
4-1/4	4-8-10-12-16

Many more sizes in stock up to 6" dia.

LEFT HAND N.C. (USS)—N.F. (SAE) SIZES

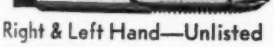
SEE ABOVE SECTION FOR MORE SIZES

SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40-48	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

'OVERSIZE' and 'UNDERSIZE' TAPS

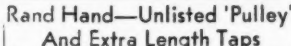
RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus	.002, .003, .005
MACHINE SCREW	#6 to #14	Plus or Minus	.003, .005, .010
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus	.003, .005, .010, .015, 1/64, 1/32



Right & Left Hand—Unlisted 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF		
1	56 NS	7/8	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 12-14 NF
9/16	12 NC, 18 NF	1-1/8	7 NC, 12 NF
5/8	11 NC, 18 NF	1-1/4	7 NC, 12 NF
11/16	11 NS, 16 NS	1-3/8	6 NC, 12 NF
3/4	10 NC, 16 NF	1-1/2	6 NC, 12 NF



Rand Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
4	36-40 NC, 48 NF	3/8	24-NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	1/2	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	5/8	18 NF
1/4	28 NF	3/4	16 NF
5/16	24-NF	Also Larger Sizes	NC & NF

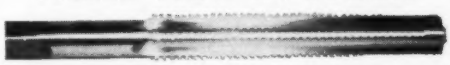
UNLISTED Right Hand "Pipe" Taps

"NPT" Taper	"NPT" Thread	"NPS" Size	"NPS" Thread	EX. LENGTHS "NPT" & "NPS" Size	EX. LENGTHS "NPT" & "NPS" Thread
1/16	27	1/16	27	1/16	27
1/4	27	1	8	1/8	27
2-1/2	8	1-1/4	11½	1/4	18
3	8	1-1/2	11½	3/8	18
3-1/2	8	2	11½	1/2	14
4	8	2-1/2	8	3/4	14
Also British		3	8	1	11½
		3-1/2	8	Also British	
		4	8		
		Also British			

Lefthand 'Pipe Taps' Taper and Straight

Size	Thread	Size	Thread
1/16	27	1	11½
1/8	27	1-1/4	11½
1/4	18	1-1/2	11½
3/8	18	2	11½
1/2	14	2-1/2	8
3/4	14	3	8
Also British		3-1/2	8
		Also British	

ACME TAPS IN STOCK



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(a) Kind of material being machined.
(b) Depth of hole in inches, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machined stopped for release of tap.
(g) If possible, submit thread length, and overall length of tap desired with blue print.

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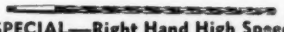

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FIELD TOOL SUPPLY CO.

Industrial Cutting Tools

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All Phones: Financial 6-1195

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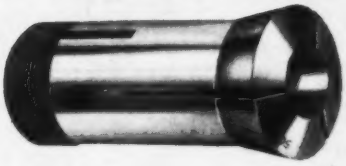

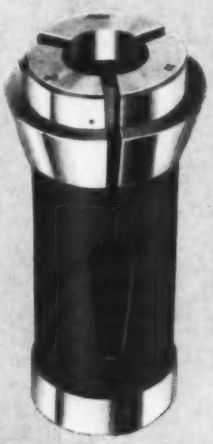

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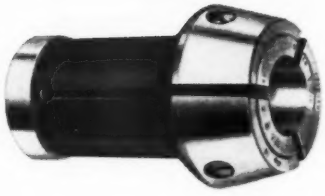

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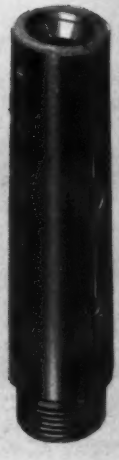

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